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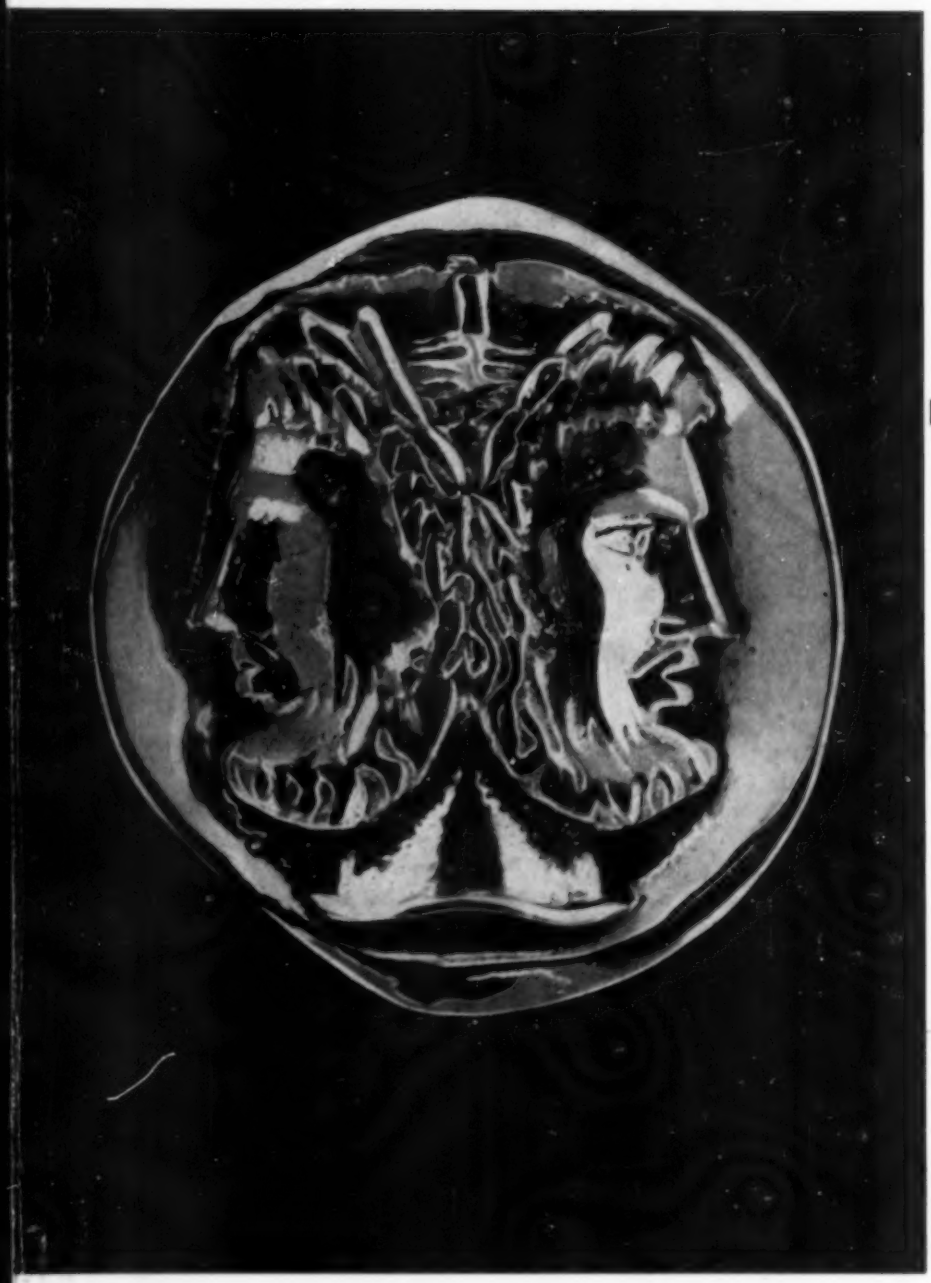

January 1955

Annual Review And Forecast

Nineteen editorially prepared articles reviewing the industrial developments of the past year and looking into the year ahead

•

Steam Generators
Pumps
Electric Motors
Piping, Valves, Specialties
Refractories, Insulation
Air Conditioning, Heating, and Ventilating
Diesel and Gas Engines
Industrial Lighting
Compressors
Heat Exchangers
Power Transmission
Instrumentation, Control
Electrical Distribution
Fire Protection
Materials Handling
Turbines
Water Treatment
Lubrication
Metals and Welding

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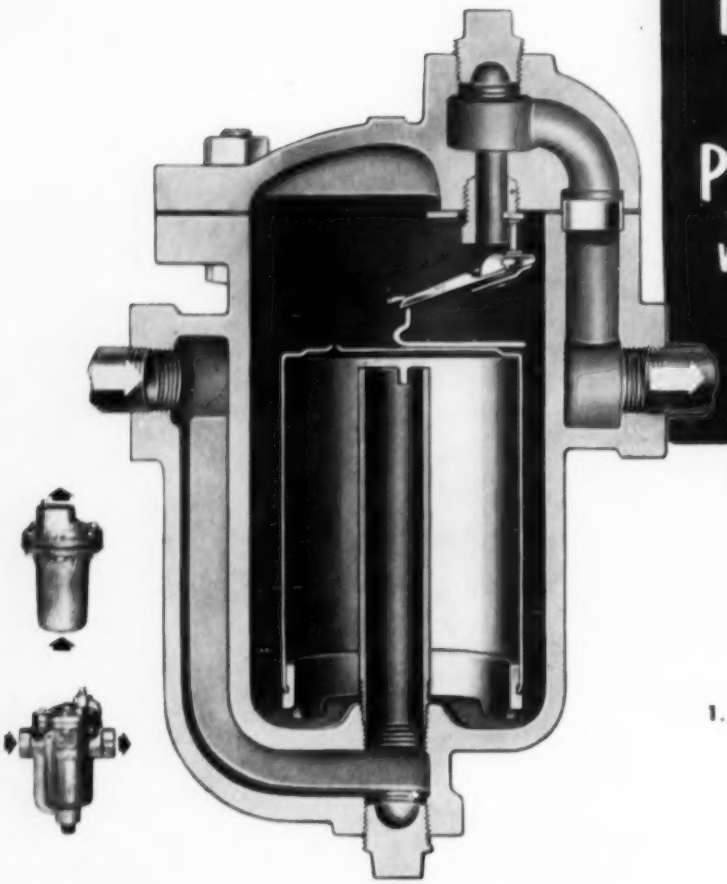
New Products of 1954

Annual Review and Forecast

MORE TRAP CAPACITY PER DOLLAR with Armstrong two-phase leverage



Two-phase steam trap leverage is an original development by Armstrong and has been incorporated in Armstrong traps since the memory of most engineers runneth not to the contrary. It provides:

1. High initial leverage to open the valve against pressure.
2. Secondary lower leverage which permits the valve to travel well clear of the seat to minimize restriction to flow of condensate.

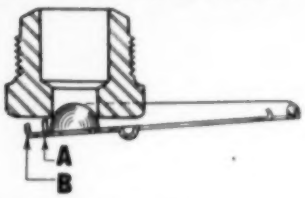
A single-phase lever can open just as large a valve *or* give just as great valve travel, ***but not both.*** Thus, Armstrong two-phase leverage gives very much greater capacity, depending on trap size than the earlier leverage system.

> No steam trap gives greater actual hot condensate capacity, size for size, and dollar for dollar, than an Armstrong!

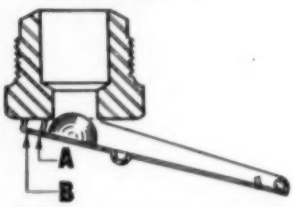
For complete data call your local Armstrong Representative or send for the 44-page Steam Trap Book.

ARMSTRONG MACHINE WORKS
820 Maple Street, Three Rivers, Michigan

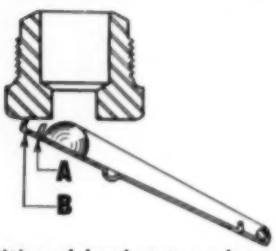
HOW IT WORKS:



1. Valve in closed position.



2. As the bucket starts to sink, the lever fulcrums at "A", giving high leverage to open the valve against pressure. When valve is well open, the secondary fulcrum "B" touches the face of the valve seat.



3. Additional bucket travel results in fulcrum "B" becoming the pivot, permitting the valve to be opened wider so that restriction to flow of condensate is minimized.

ARMSTRONG STEAM TRAPS

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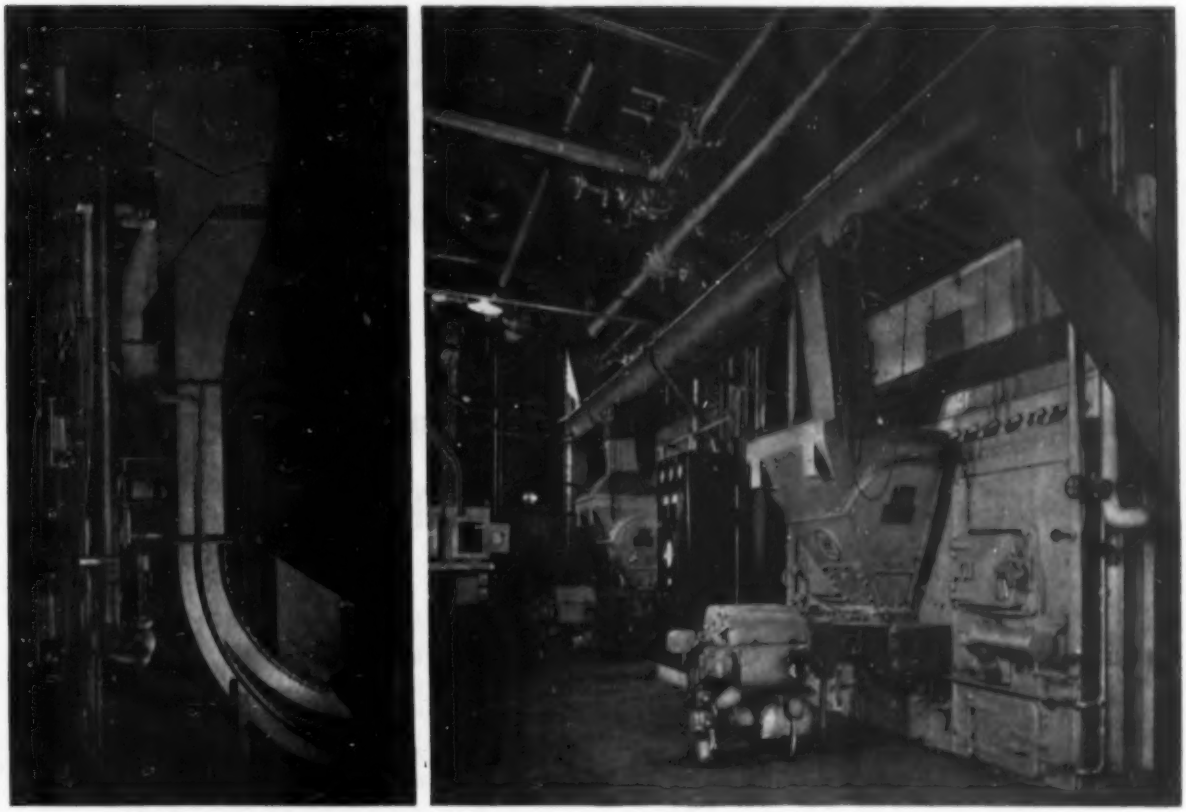
Hospital gets dust-free coal handling . . . AT LOWER COST!



Left: Link-Belt Bulk-Flo conveyor-elevator moves coal from storage bunker to screw conveyor, serving stoker hoppers of two steam boilers (right). Coal discharge is regulated by sidegate at hopper bottom. Power is transmitted by individual Link-Belt gearmotors and roller chain drives. Conveyors are enclosed to retain dust.

Steam plant is modernized with LINK-BELT Bulk-Flo and Screw Conveyor System

DEMANDING high standards of cleanliness, Butler (Pa.) County Memorial Hospital installed a compact, enclosed Link-Belt coal conveyor system. Replacing manual shoveling, the present arrangement requires only that the attendant open discharge gates by means of a hand wheel . . . then press a button to set conveyors in motion.

Whether your plant is large or small . . . inside or outside storage . . . supplied by boat, rail or truck—Link-Belt has successfully built many similar installations. Applying that vast and varied background to your problems results in top efficiency . . . lower cost per ton of coal handled. And remember: Link-Belt engineers think in terms of a complete line of equipment. Recognizing your needs, they can select the right elements to fulfill them most simply, effectively and economically.

Send today for a copy of Book 2410 . . . 44 pages of drawings and photographs of many outstanding coal handling systems of all types — large and small.

LINK-BELT

COAL HANDLING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 11.470

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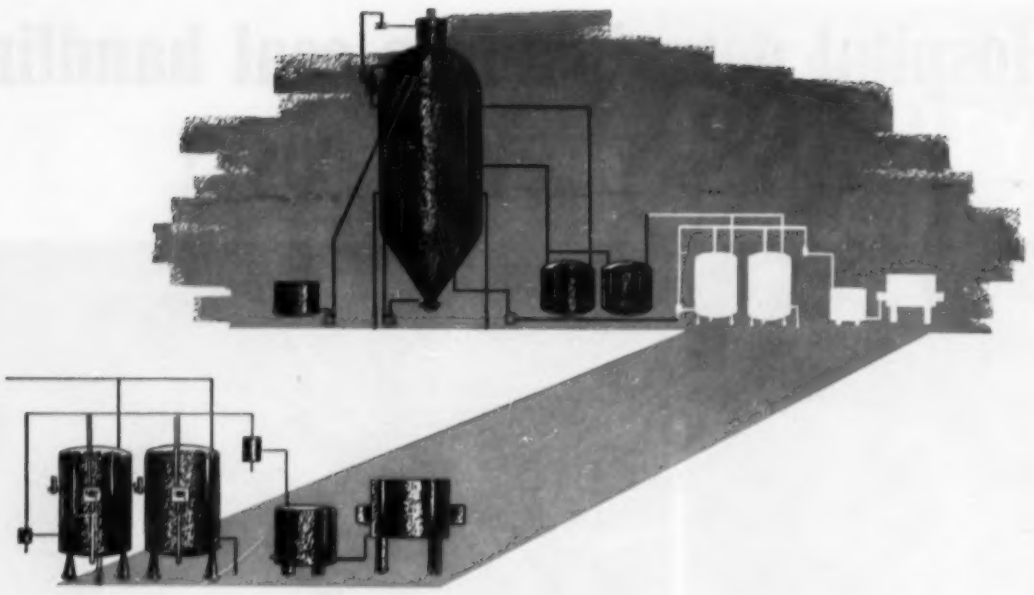

Your present or future Hot Process + Cochrane Hot Zeolite

=HIGHER QUALITY, LESS COSTLY WATER

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A Cochrane Hot Zeolite Softener, installed on the filter effluent of your system provides water of zero hardness, lowers alkalinity to approximately 25 parts per million and minimizes carbon dioxide in the steam. By proper treatment in the complete system silica can be reduced to low limits.

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Cochrane engineers and manufactures every type of precipitation and ion exchange water conditioning equipment, thus assuring you unbiased recommendations for equipment best suited to your requirements. Cochrane's *complete* service provides single responsibility for engineering, fabrication and continued satisfactory operation.

For further details on Cochrane Hot Zeolite Softeners, write for Publication No. 4801 and reprints on Hot Process-Hot Zeolite.

Other Cochrane Processes

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Delivers solids-free, silica-free water at extremely low cost. Publication 5800.

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Delivers hot deaerated water with an oxygen content not to exceed 0.005 cc. per litre—less than 7 parts per billion! Publication 3005 and 4643.

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Volume 68 **January 1955** Number 1

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Place a rubber band around the handles of a No. 234 "Multi-Plier," and grip a hard-to-hold object, like a piece of pipe. Suspend the plier by one handle only, and note how the jaws hold the weight securely without further pressure. Now try the same test with an ordinary two-piece plier — see what happens.

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Increases Your Gripping Power 10 Times!

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Everyone should own PROTO's new "Multi-Plier"—a multi-purpose, multi-pressure plier that is really a "chest of tools in one." By using a patented three-piece design to compound the leverage, pressure applied to the handles is increased *ten times* at the jaws. That means you can hold square, round and even tapered objects securely with just a slight grip. The plier gets into hard-to-reach places, works safely at any angle, and holds small or large objects, having four different jaw opening positions. First try this revolutionary plier — No. 234 — at your PROTO dealer's, and then buy one! Send 10¢ for 68-page catalog of entire PROTO line to

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Five More New Pliers

All are time savers for a multitude of industrial jobs. No. 204 is a handy midget diagonal side cutter. No. 222 is a long needle nose plier—ideal for many types of wiring. No. 225 is like the 222 except that it has a curved nose. No. 228 is an extra long, short nose needle nose plier. No. 243 is an all-purpose multi-groove joint plier.

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Controlled Air Pollution

● Reduced costs of operating the equipment used to regulate industrial air pollution can be achieved now by means of automatic controls. The economy is attributed to a new control device that will activate the equipment only when wind speed and direction create an objectionable pollution condition.

Brainy Calculator

● An AC network calculator, described as the largest of its kind in the world, has been put into service at the East Pittsburgh Plant of the Westinghouse Electric Corp. The new calculator, designed to accommodate the largest interconnected systems and power pools in existence, has 668 circuit components for representing generators, transformers, transmission lines, and loads.

Gasketless Joint

● A high-pressure, high-temperature gasketless joint for stainless steel piping, which performs satisfactorily at temperatures up to 600 F and pressures to 1600 psig, has been devised. The joint offers advantages of size, cost, ease of assembly and disassembly, and freedom from corrosion and water contamination where gaskets and welded parts come in contact with high-temperature piping. The principle involved appears to be capable of ready extension to other materials.

Turbine Alloy

● The results of a successful test using Kentanium—a sintered titanium carbide made by modern powder metallurgy techniques — in critical parts of an experimental gas turbine, raised the probability that eventually gas turbines can be made to operate at temperatures well in excess of 2000 F. During the test, the turbine operated continuously for 100 hours at a temperature of about 1900 F and speed of 30,000 rpm with no apparent change in the parts. With Kentanium used in jet engine parts, for example, the turbine's power could be increased 50 percent.

Nylon Lubricant

● Dry nylon, because of its high coefficient of friction, is not a suitable solid lubricant, according to studies carried out at the Naval Research Laboratory on the friction and lubrication of nylon. It was also learned that a satisfactory lubricant — for nylon gears or bearings — is one that will either allow the nylon to absorb the oil or grease or else form a thin lubricating film on the surface of the nylon, without attacking the plastic. A variety of liquids were found to be suitable bases for oils or grease.

Competitive Power

● An experimental boiling water reactor, designed to produce 20,000 kw of heat and 5,000 kw of electricity, will be erected by Argonne National Laboratory, near Chicago, as part of the AEC's five-year program for development of competitive electrical power from nuclear fuel. Development of the reactor follows promising investigations by Argonne in which a small temporary reactor converted water into steam directly.

Good Behavior

● A robot test unit to permit engineers to estimate the effect of the addition of new equipment to an industrial operation without actually test-installing the equipment has been developed by the Minneapolis-Honeywell Regulator Co. The electronic testing system, known as a servo-analyzer, automatically translates behavior characteristics to a chart record which is analyzed to determine how a component will affect the over-all operations.

Versatile Aluminum

● An aluminum alloy, designed primarily for the cathodic protection of steel ship hulls in sea water, has been developed. Anodes cut from this metal are said to relieve corrosive attack on the hull. Other potential applications reported include the protection of heat exchangers, storage tanks, and condensers.

Tubing News

● Tubing can be created within a single homogeneous sheet of metal by a new process developed by the Olin Mathieson Corp. The new process is expected to find major use in air-conditioning, heating, and other industrial activities. Copper, steel, and aluminum are metals that can be used.

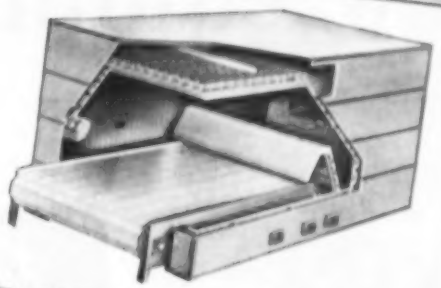
MOIST FUEL CELLS

An important application of B-L unit-suspended walls and arches is found in furnaces where a fuel with a high moisture content is burned. Although designed primarily for use in cane sugar countries for bagasse burning, these furnaces have proven so successful in other fields such as the burning of bark and wet wood refuse.

BIGELOW-LIPTAK *Corporation*

UNIT-SUSPENDED WALLS AND ARCHES

In Canada BIGELOW-LIPTAK OF CANADA LTD. *Toronto Ontario*



DRYER FURNACES

A tough assignment for a furnace is to stand up under the every-day beating of heat in drying applications. B-L's streamlined thin wall dryer furnace does it—cuts maintenance to boot. It furnishes heat for drying coal, sugar, salt, lumber, chemicals.

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LOWEST MAINTENANCE

When you specify a B-L furnace enclosure you can be sure of long life and lowest possible maintenance. Intelligent engineering and top-quality materials provide the stand-up stamina that makes enclosures "tougher than blazes." Each unit is individually designed for the job. Write today for complete information.

Castable Linings

B-L's castable lining for oil refining furnaces provides a smooth monolithic wall capable of resisting abrasion and standing up under high heat demands. The construction is adaptable to catalytic regenerators, catalytic reactors, cyclones, stacks and other refinery equipment.

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new equipment

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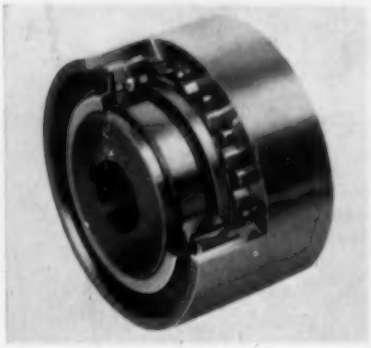
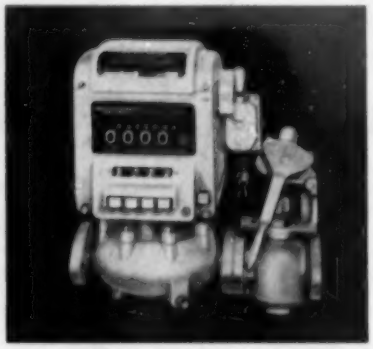
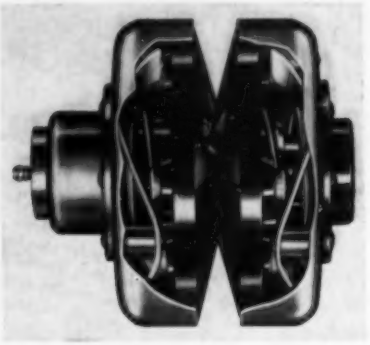


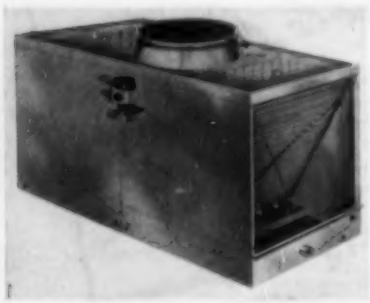
A10 CAM CLUTCHES for indexing applications in a wide variety of machinery drives are available from Morse Chain Co. in three standard models with both standard and made-to-order keyswayed and setscrew bore sizes. Designated the Series HT Cam Clutch, this self-contained unit includes a single row ball bearing that helps maintain concentricity of inner and outer races. Applications include general duty over-running and backstop operations.



A12 AUTO-SWITCH METER with built-in, explosion-proof electrical switch is actuated automatically when any desired quantity of liquid has passed through the meter. The switch can be used to turn the pumps on or off, actuate solenoid valves, start agitators, or control other cycling operations by use of suitable relays. The switch feature is available either with or without mechanically coupled Auto-Stop valve, also actuated by tripping mechanism. Neptune Meter Co.

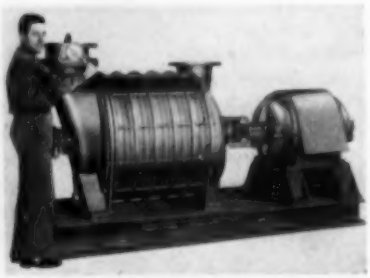


A14 AUTOMATIC PULLEY—Infinitely variable speeds from a constant speed motor are possible with Hi-Lo automatic pulley designed to handle a variety of operations from heavy construction to mining and metal finishing, according to the manufacturer, Equipment Engineering Co. Cam and cam follower assembly on the back of the pulley faces allow pulleys to adjust automatically to maintain a given speed with large load variation.



A11 AQUATOWER—Suitable for industrial water cooling as well as air conditioning and refrigeration, the Packaged Double-Flow Aquatower introduced by the Marley Co. will handle water cooling loads in the 60 to 100 ton range. Units are factory assembled in three subassemblies which can be easily put together in the field. Erection takes only a few hours. Features include self-cleaning cold water basin.

A13 CO-AXIAL DISC type cell and valve assembly for detecting impurities in fluids has been developed by McNab Inc. to be used with McNab Salinity Indicators and other conductivity devices. A device to automatically compensate for the temperature change of the fluid can be included in the body of the cell when automatic temperature compensation is desired. Available in sizes down to ¾ in. NPT, the cell is said to permit easier, faster cleaning of the unit. The assembly is available in several metals.

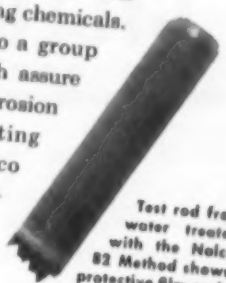


A15 BLOWERS—Multistage, standard production centrifugal blowers with extreme adaptability have been announced by the Air Appliance Div., U. S. Hoffman Machinery Corp. The #385 frame unit is capable of delivering air volumes between 1500 and 500 cfm, with pressures ranging from 1 to 9 lb gage, or vacuum from 2 to 12 in. Hg. Using a combination of two interchangeable impellers, the series 385 blower can be factory assembled.

NOTE—Each new product item has a key number for your convenience in asking for additional, detailed information. Circle this number on Reply Card, pages 34/35 & 98/99.

Forest of Facts on Nalco® RECIRCULATING WATER TREATMENT

NALCO Laboratories' continuous research program has gathered this forest of facts about protecting recirculating water systems. In the search for the most effective *and economical* formula, the metal rods shown have been rotated in all types of recirculating waters and treating chemicals. Results pointed the way to a group of Nalco Treatments which assure users against scale and corrosion in virtually any recirculating waters. For details on Nalco Treatment to fit your particular system, call your Nalco Representative, or write direct.



Test rod from water treated with the Nalco 82 Method shows protective film and freedom from any scaling or corrosive attack.

THE Nalco 82 METHOD MAY BE THE ANSWER FOR YOU

The Nalco 82 Method is particularly suitable for scale and corrosion control in recirculating water systems which fall within the characteristic limits given here. Check them to see if your system should have Nalco 82 Treatment:

- Equipment to be protected contains steel and/or brass.
- Hardness of makeup water is more than 50 ppm; and sulphates and chlorides, as sodium salts, are less than 150 ppm.
- Calcium hardness of makeup can be as much as 500 ppm.
- Silica content of makeup water up to 50 ppm.
- Total alkalinity of makeup more than 40 ppm.
- Recirculation rates between 100 and 100,000 g.p.m.
- Where non-toxic waste water is required.

Act today to get the certain, low-cost protection of The Nalco System. Full data on Nalco 82 in free Bulletin 68.

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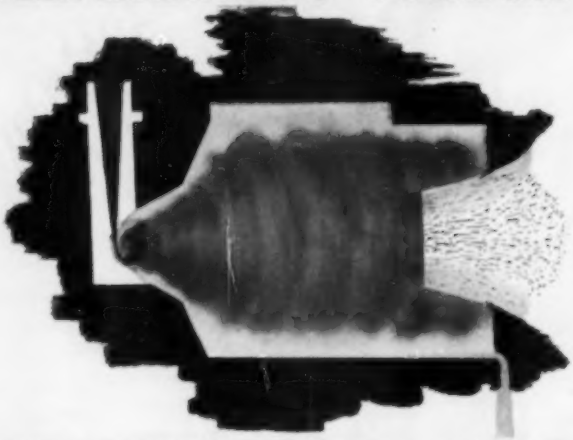
EASTMAN KODAK SELECTED A



B&W CYCLONE FURNACE BOILER

Faced with all of the problems common to power generation — fuel quality, fly-ash handling, unit availability, initial cost, maintenance cost — Eastman Kodak also has had to give major attention to the all-important factor of cleanliness at its Kodak Park Works. Absolute cleanliness is essential to the manufacture of sensitized paper and photographic film to maintain Kodak's high standard of product quality. Of equal importance is Eastman's outstanding reputation as a "good neighbor" to the thousands of citizens who have built their homes in the vicinity of Kodak Park.

After a long period of careful study and comparison of various types of steam generation units and firing methods — including many visits to utility and industrial power plants—Eastman Kodak engineers chose a B&W Pressurized Cyclone Furnace Boiler.

Here are some of the facts you will want to consider about the Cyclone Furnace:

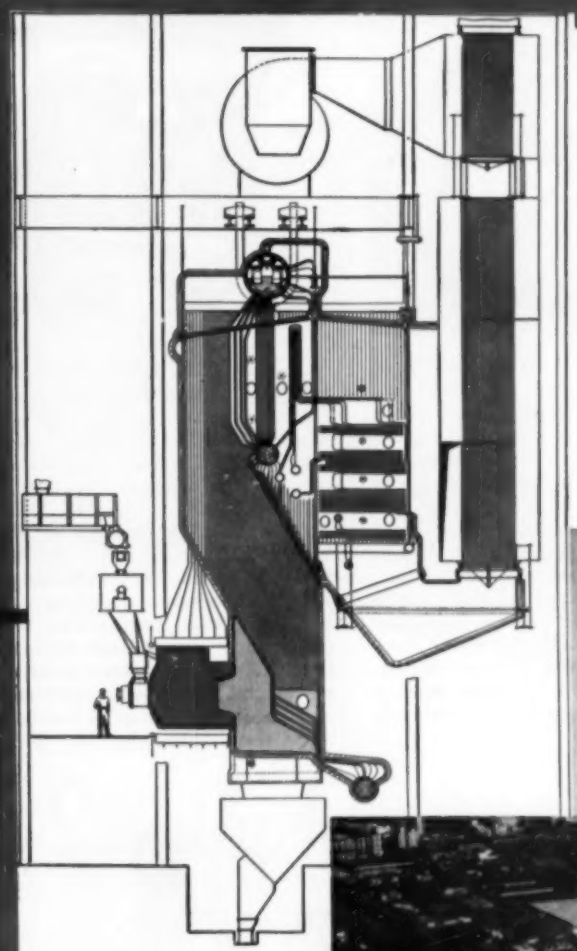
FLY-ASH ELIMINATION—The Cyclone's ability to melt most of the ash to slag in the furnace, holding fly-ash emission to an extremely low level, is vitally important. And with the use of collectors, the small amount of ash that escapes initial melting can be returned to the furnace and converted to readily disposable slag. In addition to cleanliness, this elimination of fly-ash represents substantial savings in ash control, handling and disposal.

SAFER OPERATION—With far fewer burners to light and very fast ignition, the Cyclone Furnace is safe, simple and easy to operate. Combustion controls are greatly simplified.

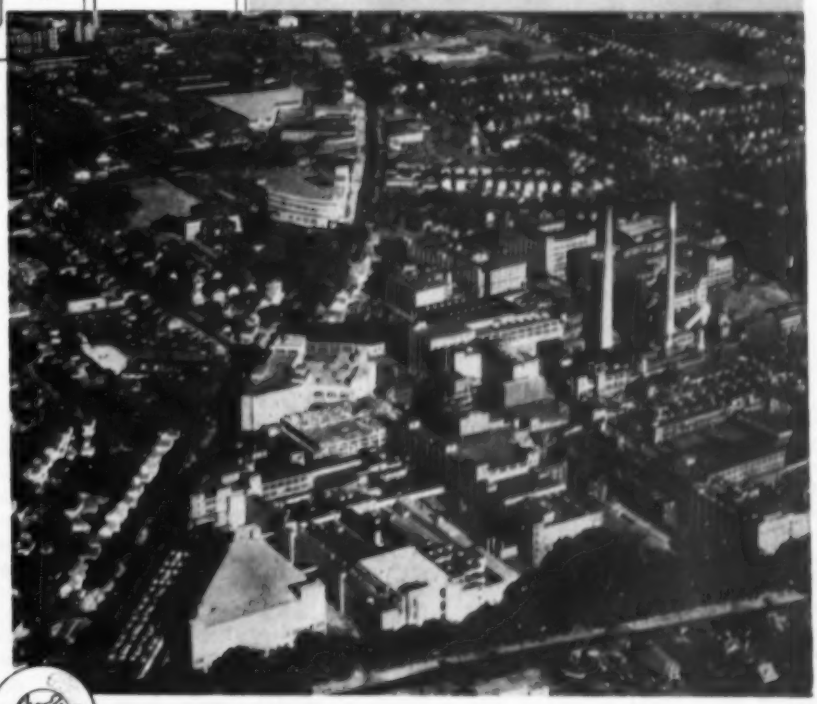
BURNS A VARIETY OF FUELS ECONOMICALLY—Designed to handle efficiently a wide range of coals including the poorer grades, the Cyclone Furnace is also ideally suited for burning oil or gas. Because it can be switched from fuel to fuel almost instantaneously, no time is lost and advantage can be taken of fuel price fluctuations.

LESS MAINTENANCE—As there are no pulverizers with motors, fans, ducts, and piping, and as there is so little ash in the flue gas to cause abrasive wear, maintenance is reduced, even when normally troublesome coals are burned.

Eastman Kodak is the most recent addition to the mounting list of large industrial and utility companies to turn to the cost-saving advantages of the Cyclone Furnace. B&W's technological knowledge gained through development of and experience with the Cyclone Furnace and many more major engineering advances in steam generation, is available to you at any time. The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N. Y.



B&W Pressurized Cyclone-Fired Radiant Boiler to be installed in the latest addition to Eastman's Kodak Park Works Power Plant, Burns & Roe, Inc., Engineers. Equipped with two Cyclones, the unit will generate 400,000 pounds of steam per hour and will burn coal or oil. Design pressure is 1575 psi. Pressure at the superheater outlet is 1425 psi, temperature is 900 F.



BABCOCK & WILCOX

BOILER DIVISION

G-699

Circle 506 on Reply Card for more data

new equipment

—Starts on page 8

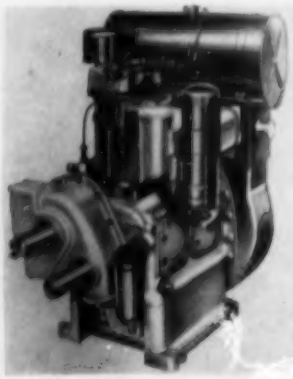
A16 TANK LINING — For protecting new tanks or for restoring old ones, Emjay Maintenance Engineers have developed a lining system based on the use of Expansolin, a ceramic material with the ability to expand and contract with the iron or steel to which it is bonded. The lining is said to have excellent adhesion, inertness to hot or cold water, will not contaminate contents, resists sludge and lime build up, increases heat exchange rates, and has good insulating value. The protective layer will not crack or otherwise fail when subjected to temperatures from 34 to 230 F.

TO REQUEST ADDITIONAL DATA

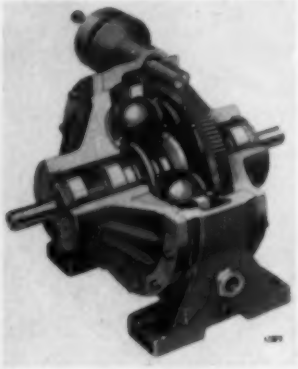
Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

A18 TORQUE CONVERTER — Where length is a problem, the Model C-20 short coupled torque converter will be particularly helpful, according to the manufacturer, Funk Aircraft Co. It is available in either ventilated or non-ventilated type with the main body a one-piece steel casing, machined to fit engines with SAE flywheel housings. Standard outside flanges quickly attach to the right angle drives, transmissions, gear reductions, power take off hubs, and other types of drives. A catalog of the complete line of Funk power transmission equipment is available.

A20 MOTOR TESTER — For determining direction of rotation of electric motors before they are connected to the line or for determining phase rotation or sequence of energized power circuits, the James G. Biddle Co. has designed the Biddle Motor Rotation and Phase Tester. The instrument eliminates need for temporary connections which can be time consuming, costly, and hazardous, particularly where many large high-voltage motors are involved. It determines polarity of power and instrument transformers, and can be used as a continuity tester in checking electrical circuits.



A17 AIR-COOLED ENGINES, made in single-cylinder and twin-cylinder models of the four-stroke type by Armstrong Siddeley Motors, Ltd., England, are designed for locations where there is danger from freezing. The single-cylinder engine develops 6 to 11 hp at 1000 to 1800 rpm and the twin-cylinder develops 14 to 22 hp at 1000 to 1800 rpm. Electric starting equipment is provided as required, but use of standard hand-crank allows easy starting from cold. Exclusive distributor within the United States for these engines is the Engine Division of National Supply Co. Engines are said to operate reliably in either hot or cold locations.



A19 SPEED VARIATOR, introduced by Cleveland Worm and Gear Co., is regulated by a simple manual adjustment, with indicator, or by manual or power operated remote control devices. Nine sizes are available ranging from ½ to 10 hp at 1750 input rpm. Relative speeds of the two shafts are adjusted through a 9:1 range by changing angular positioning of axles on which the balls rotate, resulting in an infinitely variable and stepless range of output speeds from one constant speed power source. Bearing support is ample for both input and output shafts to carry overhung pulleys. It is patterned after the Swiss Kopp Variator.

A21 TROLLEYS — In recognition of the increasing importance of overhead trolley conveyors as one of the more versatile and flexible conveying mediums, Link-Belt Co. has developed a line of ball bearing trolleys to be known as the Series 500. Labyrinth seals are normally furnished in the trolleys, but other types can be provided for special conditions. Trolleys are designed for use on 3, 4, or 6 in. I-beams and are interchangeable with most other trolleys commonly used with rivetless conveyor chains. Two types are available: the bolted wheel and bracket for ease of assembly and disassembly; and riveted, for permanent assembly.

BETZ • *A Great Name*
In Water Conditioning

Strictly for the record

■ Recently, one of our visitors referred to this room as the Betz "Laboratory of Water Conditioning Experience". Actually, he wasn't far wrong.

For in these files are literally thousands of *staff-written* technical papers, articles, bulletins, and reports, covering just about any aspect of water conditioning about which industry might want information.

This represents the kind of leadership for which the Betz Organization is justly famous . . . the fundamentals of water conditioning written authoritatively, accurately . . . performing a service to industry not duplicated anywhere.

If you have a question, or a problem regarding *any phase of industrial water conditioning*, write us. Information covering the subject will be on its way to you promptly. No obligation, of course.

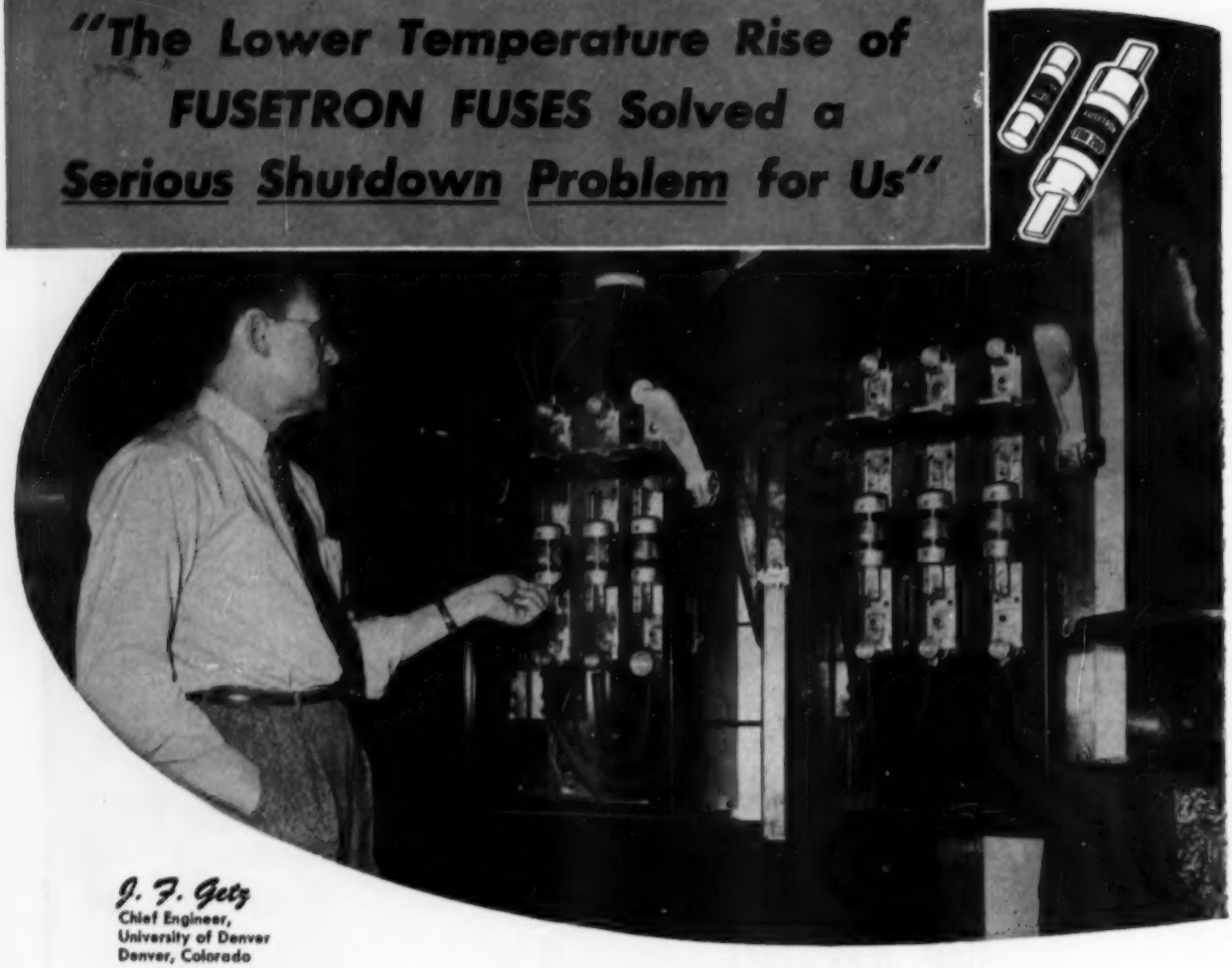
W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Circle 507 on Reply Card for more data

"The Lower Temperature Rise of FUSETRON FUSES Solved a Serious Shutdown Problem for Us"



J. F. Getz
Chief Engineer,
University of Denver
Denver, Colorado

"The fine, new Field House we built in 1949 included an ice skating rink. The ice making equipment uses two 3 phase, 220 volt, 100 hp., compressor motors having a running current of 246 amperes.

"Ahead of the magnetic starters for these motors were two 400 ampere safety switches originally equipped with 400 ampere renewable fuses.

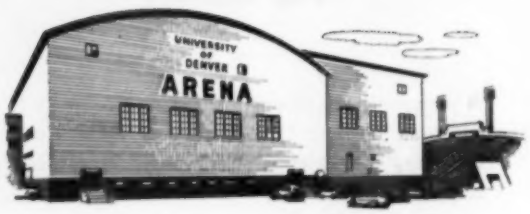
"Shortly after the compressors went into service heat began developing in the safety switches. The fuses were running very hot — in fact to such a degree that the links in the fuses were melting and causing as many as three shutdowns a week.

"In August of 1951 I saw a demonstration by a BUSS representative that showed how much cooler was the operating temperature of Fusetron fuses.

"Right then, I determined to try out Fusetron fuses in these two switches. To get better protection I dropped the fuse size down to 300 amperes.

"With the installation of Fusetron fuses the heating immediately disappeared and so did the shutdowns it formerly caused.

"The lower temperature rise of Fusetron fuses solved a serious shutdown problem for us."



YOU TOO, CAN MINIMIZE PLANT SHUTDOWNS AND EQUIPMENT LOSSES BY INSTALLING FUSETRON FUSES — THEY GIVE 10 POINT PROTECTION

1 Protect against short-circuits. **2** Protect against needless blows caused by harmless overloads. **3** Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation. **4** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5** Protect motors against burnout from overloading. **6** Protect motors against burnout due to single phasing. **7** Give DOUBLE burnout protection to large motors — without extra cost. **8** Make protection of small motors simple and inexpensive. **9** Protect against waste of space and money — permit use of proper size switches and panels. **10** Protect coils, transformers and solenoids against burnout.

Circle 508 on Reply Card for more data

And with FUSETRON FUSES you have Greater Safety, because of their 100,000 amp., Interrupting Capacity Rating

Tests verified by the Electrical Testing Laboratories of New York show that Fusetron fuses, on loads under 600 amperes, can interrupt safely the most severe available short circuit currents.

The test circuits were set to deliver far in excess of 100,000 amperes — yet the 250 and 600 volt Fusetron fuses on each and every test cleared the circuit without igniting readily flammable material placed around the fuses . . . and there was comparatively little noise.

You get all this added safety for every set of fuse clips in your plant without changing a panelboard or switch

No Interference with time-lag

Fusetron fuses' time-current characteristic, of the utmost importance to give proper motor and electrical protection and to eliminate needless blows, has in no way been disturbed.

For High Interrupting Capacity above 600 and up to 5000 amps. — Install BUSS Hi-Cap Fuses

BUSS Hi-Cap fuses offer unlimited interrupting capacity for circuits of 600 volts or less. Their high speed operation on heavy shorts limits current to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

When coordinated properly with Fusetron fuses they will not open ahead of the fuse nearest to the fault—thus the trouble is isolated to the part of the circuit in which the fault occurs.

Added Safety on Old Installations

On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of a bad fault.

Maximum Safety

With Fusetron fuses there is no cascading of interrupting rating — no places where an excessive fault current might cause serious damage. Every Fusetron fuse has an interrupting rating in excess of 100,000 amperes.

You don't have to worry about selecting chosen spots in which to pay extra for "safe" equipment. Wherever a Fusetron fuse is installed you have safety as sure and dependable as you can buy — no matter what you pay.

No Maintenance Costs

Once properly installed Fusetron fuses are maintenance free. They require no costly inspection or down-time for calibration and other maintenance necessary on mechanically operated devices.

Dust, fumes, corrosion or age cannot prevent a Fusetron fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

No Recalibration Costs

When a Fusetron fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS — a fuse that is as safe and dependable as the one that blew.

PLAY SAFE—Install FUSETRON Dual-Element Fuses and BUSS Hi-Cap Fuses throughout the entire electrical system . . . Today!

One needless shutdown . . . one lost motor . . . one destroyed switch or panel . . . one burned out solenoid . . . may cost you far more than replacing every ordinary fuse with a Fusetron fuse on loads up to 600 amps — and BUSS Hi-Cap fuses on loads above that.

Blowing time charts and more information are available. Write for bulletins FIS and HCS.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

BUSSMANN Mfg. Co.
(Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.

Please send me complete facts about FUSETRON dual-element Fuses and BUSS Hi-Cap Fuses.

Name _____

Title _____

Company _____

Address _____

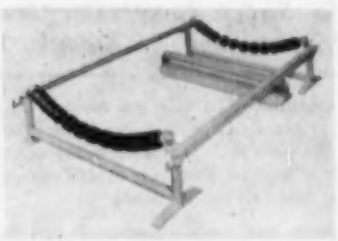
City & Zone _____ State _____

new equipment

—Starts on page 8

A22 BOILER GASKETS, when impregnated with Vike Graphite Plastic, will remain soft and can be re-used several times, according to the manufacturer of the material, Keystone Lubricating Co. Because of a high coefficient of expansion, the material is suited for high temperature services and can also be used as a positive seal for pipe joints, screw threads, gasket joints and flanges on hot or cold petroleum lines, and on propane, butane, steam, coal tar, vapor, air, and acid lines.

A23 RUBBER HOSE made of Armorite outwears steel 20 to 1 in many conveying applications, according to the manufacturer, B. F. Goodrich Co. It will take chunks of iron ore and coal up to 8 in. in length carried in a stream of water at pressures as high as 250 lb per sq in. without appreciable wear. The hose, known as Convertapipe, will convey metal shavings and chips, sand and gravel, ground or powdered chemicals, and a variety of other sharp and abrasive materials. It is available in sizes 1 to 14 in. and in constructions for working pressures from 50 to 250 lb.

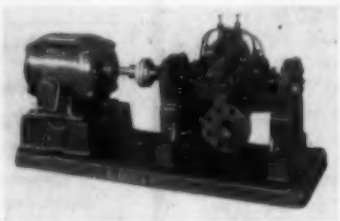


A24 IDLER—Easy assembly, moving, and simple storage of conveyor sections is claimed for the Limberoller, a flexible, 2-bearing, cable-suspension idler offered by Joy Manufacturing Co. for belt conveyor support. Available for belt widths of 24, 30, and 36 in., it is self cleaning, about 1/3 as heavy as a 3-roll steel idler, and resists abrasion, flame, oil, and corrosion. Its cushioned grip support carries the loaded belt without slipping, bumping, or splice damage.

A25 PLASTIC VALVES — All molded PVC valves and fittings resistant to corrosive chemical action have been designed by Lunkenheimer Co. Known as the Luncor line, the valves and fittings are molded in rigid form, suitable for pressures up to 125 lb and temperatures to 150 F. The valve is available in a Y-type globe design. The complete line of fittings includes caps, couplings, plugs, unions, reducing bushings, flanges, 45 and 90 degree elbows, and tees.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.



A26 TWO-STAGE PUMPS for handling clear liquids easily have been designed by Goulds Pumps, Inc. with special attention to operating efficiency and ease of maintenance. Casing is horizontally split so that the interior can be inspected, and the rotating parts removed and replaced without disturbing piping connections. Known as the Fig. 3305 line, these pumps are available in 5 sizes, providing heads up to 1000 ft and capacities up to 1000 gpm. The locking shaft sleeve makes it possible to change direction of rotation of the pumps in the field without need for any additional parts. Literature is available.

A27 BUTTERFLY VALVES—Builders-Providence, Inc., Div. of B-I-F Industries, Inc. has extended its line of butterfly valves to include rubber-seated, tight-closing butterfly valves for general service. These valves meet American Water Works Association's Tentative Standard Specifications for Rubber-Seated Butterfly Valves, AWWA C504-54T. Accessories include manual, electric, hydraulic, and pneumatic operators. Bulletins and technical data will be sent on request.

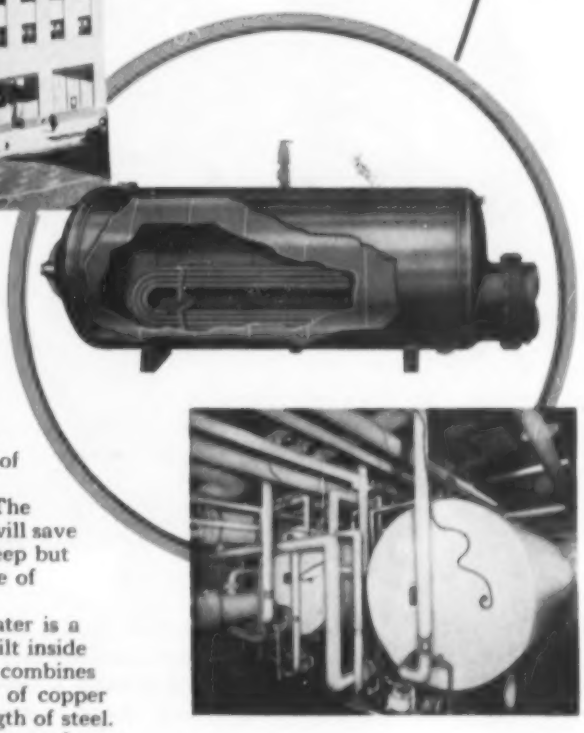
A28 BELTS—Capable of handling greater loads with smaller belts, the new line of Compass H D transmission belts announced by Goodyear Tire & Rubber Co. has also been improved in all around performance. These synthetic filament belts are thinner, more flexible, and have less tendency to stretch out of shape.

A29 MOTORS—The rib-type, enclosed, fan-cooled, wound-rotor motor announced by Allis-Chalmers Manufacturing Co. has slip-rings, brushing rigging, rotor, and stator inside a single frame enclosure. The first Allis-Chalmers explosion-proof, wound-rotor motor to bear the UL label, the new unit is available at speeds of 1800 rpm and slower, in frames 284 to 505, in standard enclosed or explosion-proof construction for continuous or intermittent application.

for Rust-Free Hot Water

look for the
Copper Lining

they did at
DUN and BRADSTREET



Copper-lined water heaters manufactured by **p-k** are a sound investment, especially for big, modern buildings such as the Dun and Bradstreet building. In their new office building at 99 Church Street in New York City, these copper-lined storage heaters supply 180 deg. F. water for the cafeteria and 130 deg. F. for general use. An abundant supply of rust-free hot water is constantly available at the turn of a spigot. The flawless operation of the heaters will save money—not only in heater upkeep but also in the proper maintenance of building services.

The **p-k** copper-lined heater is a complete copper heater built inside of a heavy steel shell. It combines non-corrosive properties of copper with the superior strength of steel.

For an unfailing source of pure, rust-free hot water—

LOOK FOR THE **p-k** Copper Lining

Comprehensive catalog gives you all the facts. It's yours for the asking.

the **Patterson-Kelley Co.,** inc.

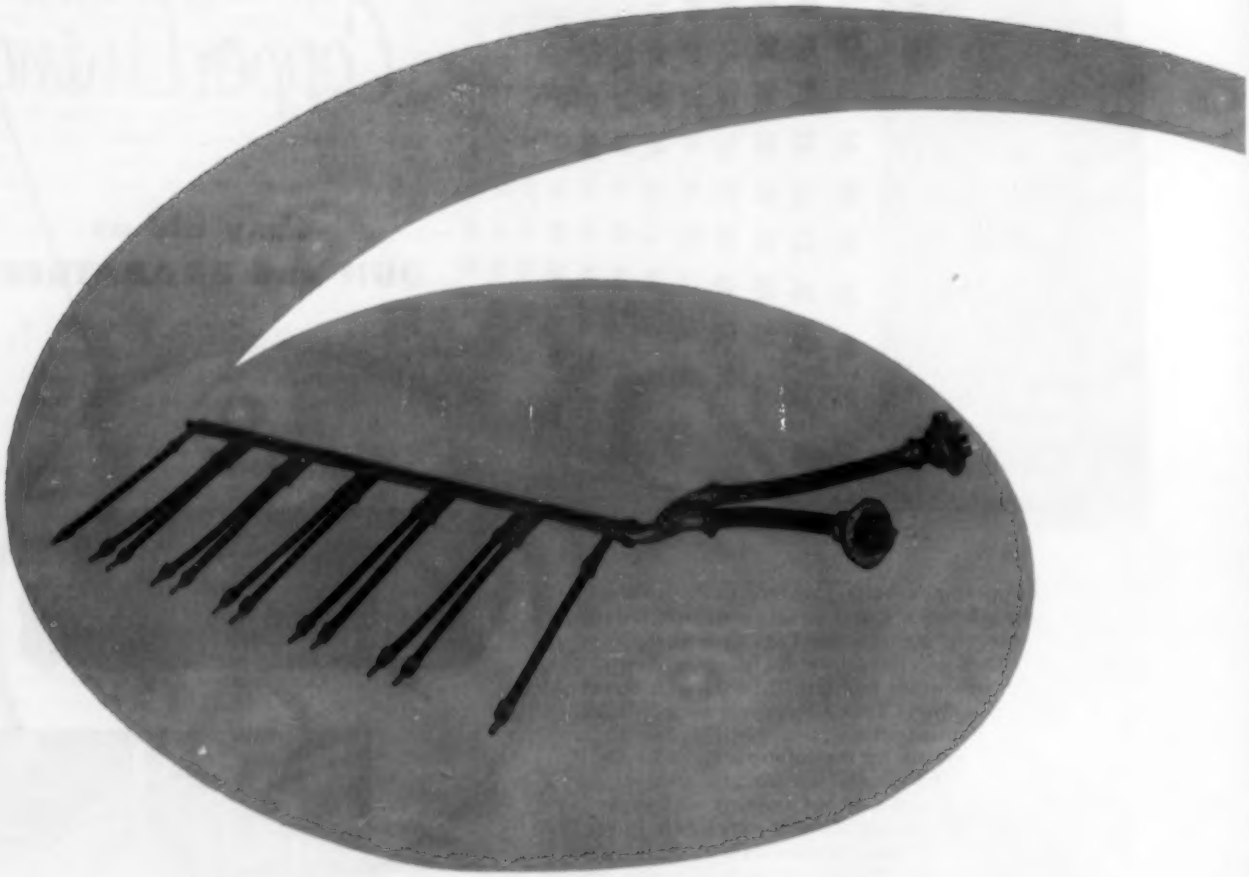
1110 Burson Street, East Stroudsburg, Penn.

2503

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

Circle 509 on Reply Card for more data

it takes RUGGED WIRING *to pass the "Combat Test"*



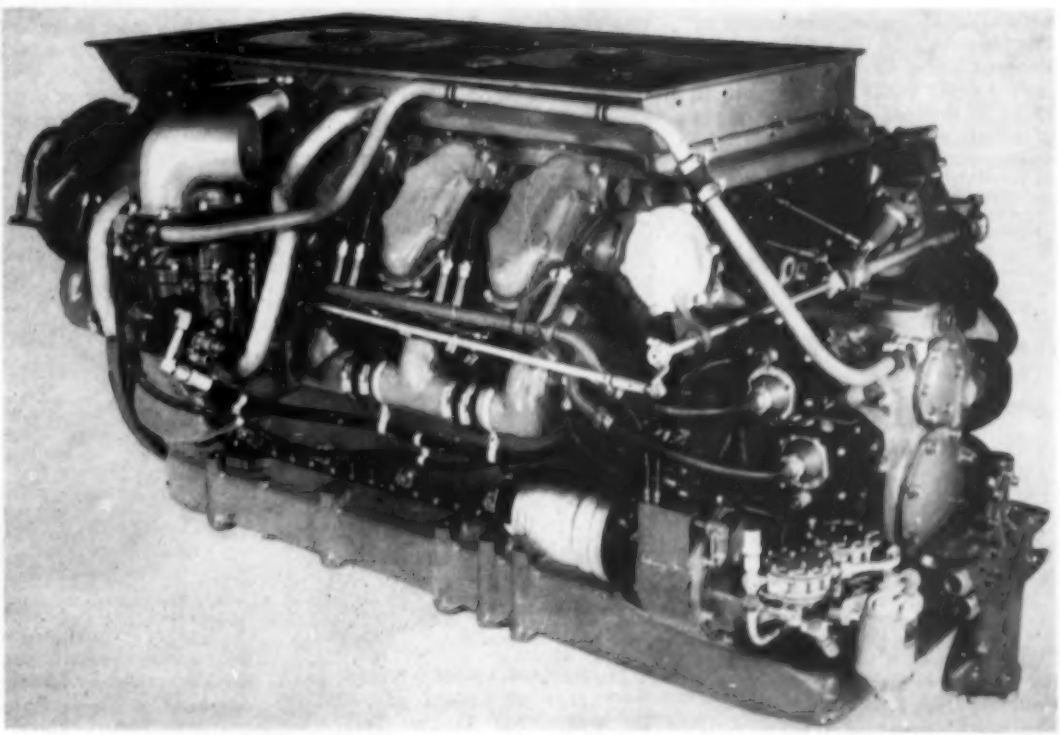
This 810 hp air-cooled engine, now available from Continental Motors Corporation for industrial applications, was first designed for the Army's famed General Patton tank. The electrical wiring ignition harness, a product of National Electric, is a high voltage, radio-shielded system. As a vital part of the Patton tank engine, it proved rugged enough for combat—resistant to extremes of heat and cold — impervious to dirt and dust of all types.

This is the kind of ignition harness you need on your industrial engines whether they are in continuous service or on vital stand-by duty. With National Electric ignition harnesses, you can be sure of quick starting, no matter how long the engine has been standing-by, to power an emergency generator or drive a fire pump. That is the reliability that comes from "combat testing."

Electrical wiring ignition harnesses are only one of the many products National Electric manufactures to provide better and more effective electrical distribution for industry.

More Than A Quarter Century Of Experience.

Control panels
Switchboard panels
Electrical timing mechanisms
Electrical temperature indicators
Automatic relay and switching devices
Electro-mechanical assemblies — manufactured to customers specifications



National Electric Manufacturing Company

NILES MICHIGAN

Circle 510 on Reply Card for more data

new equipment

—Starts on page 8

A30 MOTORS — As a companion to its line of Unibrake (magnetic type) motors, Master Electric Co. has added an a-c dynamic brake motor. Dynamic braking is built into standard frame size single or polyphase induction motors. Multipolar, two phase brake winding is super-imposed on the standard stator winding. One phase of the winding is connected to a single phase line during braking operation, second phase is permanently short-circuited and is never connected to the line. Units are now available up to 30 hp.

A31 WINTER REPAIR and resurfacing of roofs is possible with a liquid coating announced by The Monroe Co., Inc. Known as Winter Grade Wet Surface Rufferseal, it flows easily at temperatures 15 to 20 degrees colder than those at which ordinary coating can be applied and can be used on wet roofs.

A32 PILOT PLANTS — Reaction-distillation pilot plants ranging from 5 to 60 gal capacities are available from Patterson-Kelley Co. The units consist of reactor, condenser, receiver, decanter, piping, valves and instruments, all in one packaged unit. In addition, small reactors designed for flexibility and convenience in pilot work are offered. In addition to cost savings and correct design features, the "off-the-shelf" pilot plant designs are time-savers to research and development engineers and were designed to prove most pilot plant needs can be supplied from stock equipment.

A33 VIBRATING FEEDER — With capacities in excess of 300 tons per hr, Barber-Green Company's Redi-Flow vibrating feeder is light weight and low cost. It is made in 20 and 26 in. widths for feeding 24 to 30 in. belts. Lumps up to 12 in. can be handled, when mixed with fines, or to 8 in. maximum when lumps are of uniform size. Control gate is hinged to permit passage of occasional oversize lumps when handling finer sizes. Leakproof feeder pan eliminates the carryback that is sometimes a problem with apron or belt type feeders. Can be attached to hopper on the job.

TO REQUEST ADDITIONAL DATA

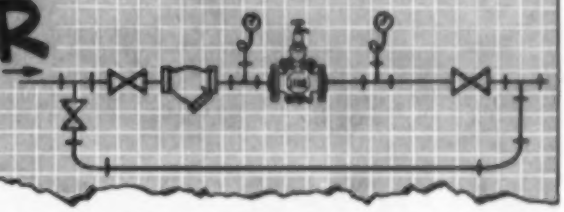
Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

A34 STEAM TRAP — Kinetic energy of steam closes the Thermodynamic Steam Trap announced by Sarco Co., Inc. The only moving part is the valve head — a solid heat-treated stainless steel disc. The valve closes tight on no load and operates against a back pressure up to 50 percent of its inlet pressure. It is designed to work as efficiently at 1 psi as at 600 psi and at temperatures to 950 F. Bodies are of cast semi-steel, carbon, or moly steel with screwed socket weld or flanged connections.

A35 A 400 AMP FRAME molded case circuit breaker developed by I-T-E Circuit Breaker Co. is designed to bridge the gap between the present 225 amp frame molded case and the 600 amp model. Known as the KL, the breaker saves cost and space when used with circuits carrying from 225 to 400 amp. More than 1/3 smaller than the 600 amp breaker, it is for use in panelboards, switchboards, motor controls, bus duct plugs, and individual enclosures. It is available in ratings from 125 to 400 amp; either two or three pole; 600 v ac or 250 v dc, 2500 amp maximum interrupting capacity.

A36 ELECTRIC STEAM generators requiring a minimum of floor space (½ sq ft per boiler hp) are announced by Livingstone Engineering Co. These Speedylectric packaged boilers, known as the Series BBC, incorporate in a single boiler drum the same self-regulating control that previously required two drums. The unit continuously and automatically regulates input of electric power to balance steam load, and at the same time maintains non-fluctuating steam pressure at desired setting. If there is no boiler water, no current flows and no heat is generated. Sizes are from 1½ to 60 bhp and pressures to 500 psi.

WHEN TO USE A REGULATOR



SELF-CONTAINED PRESSURE, TEMPERATURE AND PUMP PRESSURE REGULATORS

Leslie Self-Contained Regulators are spring loaded, internal pilot, piston or diaphragm operated with stellited seating surfaces, hardened stainless steel main valves and renewable wearing parts of heat treated stainless steel of grades best suited to the application.

Regulators are used for any one or any combination of the following conditions:

★ When quick response is necessary to handle sudden load changes.

★ When available fluid pressure supplies sufficient differential for self operation.

★ When positive dead end shutoff is required for short periods of time.

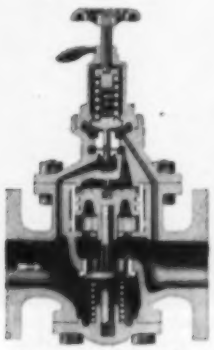
★ When one-step pressure reductions are desired.

★ When service conditions require continuous flow for varying demand.

★ When "instrument control" is required without auxiliary operating force.

★ When installation requires smallest physical dimensions.

★ When operation from either a nearby or a remote control station is desired.

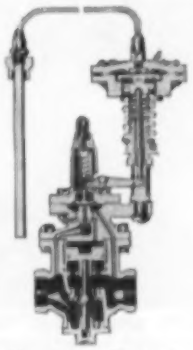


Pressure Reducing Valve
Class L-3

LESLIE
PRESSURE REDUCING VALVES

Automatically maintain a constant reduced pressure of steam, air or gas. Single seated, tight closing. Respond instantly to load changes. Renewable, interchangeable parts. Stellited seating surfaces. Complete overhaul permitted without removing body from pipe line. Made in bronze, cast iron, cast steel or cast alloy steels. Sizes ¼" to 6". Other units available for constant differential pressure, unloading, and for remote adjustment. Inlet pressures 25 psi to 1500 psi steam at 950°F. Reduced pressures 2-600 psi.

SEND FOR BULLETIN 5302



Temperature Regulator
Class LTCO

LESLIE
TEMPERATURE REGULATORS

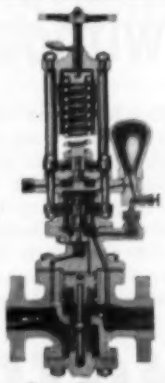
Designed for a wide range of applications. Vary the flow of steam or cooling water to heater or process to automatically maintain constant temperature. Rugged 100° F. adjustable range thermostatic element. For small and large flows, direct operated, direct and reverse acting or with "Duomatic", two-element (pressure and temperature) control. For driers, fuel oil heaters, instantaneous and storage heaters, kettles, open tanks, ovens, process heaters, degreasing machines, steam tables, sterilizers, storage heaters, urns, etc.

SEND FOR BULLETIN 5307

LESLIE
PUMP PRESSURE REGULATORS

Accurately and automatically control discharge pressure from steam operated, reciprocating or turbine driven pumps. Single seated—positive—responsive and accessible. No packed plungers or stuffing boxes. Built for constant discharge pressures of 8 psi to 2000 psi and excess pressure of 10-200 psi. For motor-driven pump discharge pressure recirculation.

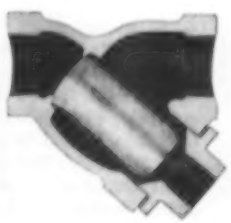
SEND FOR BULLETIN 5306



Pump Governor
Class CTHE-3

LESLIE
SELF-CLEANING STRAINERS

Recommended to protect all regulating equipment from dirt and foreign matter. Cast iron, bronze, cast steel, carbon moly, chromemoly, stainless and forged steels. Strainers with screwed, flanged, socket and butt welded connections; sizes ¼" to 10" inclusive. Primary service ratings to 2500 psi. Screens furnished in Monel and stainless steel with various perforations and meshes for liquid, gas, air, oil and steam services. For complete details on each type, ask for Bulletin 5308.



Self-Cleaning Strainer

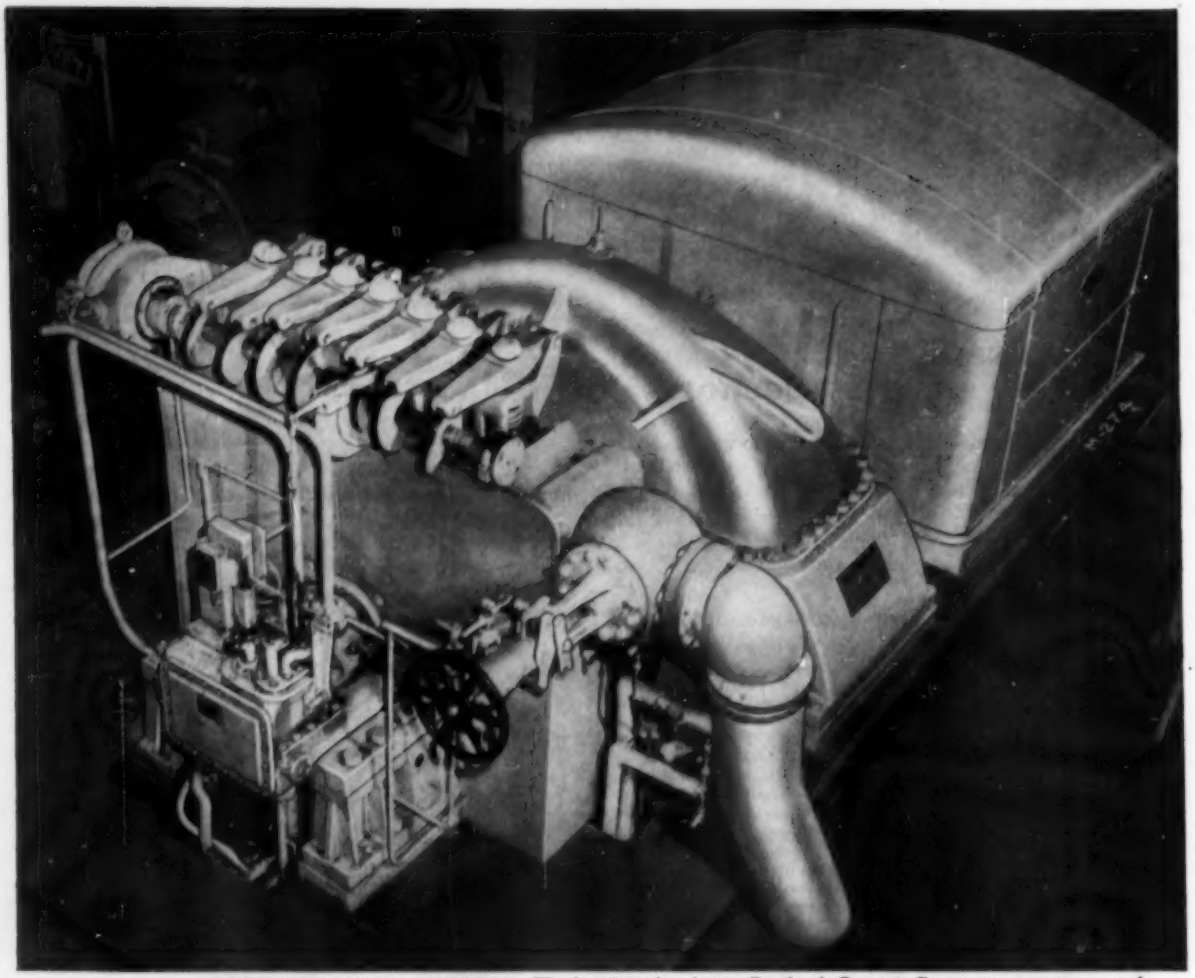
LESLIE REGULATORS

SINCE 1900

LESLIE CO., 243 GRANT AVENUE • LYNDHURST, N. J.

"STILL FAR AHEAD IN QUALITY AND PERFORMANCE"

Circle 511 on Reply Card for more data



NON-STOP POWER GENERATION. That's what the Aetna Portland Cement Company expects — and gets — from its 5000-kw Worthington turbine-generator despite the roughest kind of operating conditions.

Runs 52,500 hours without a break

Six years of 24-hour-a-day operation without a stop, except for annual plant shutdown.

That's the record this 5000-kw Worthington turbine-generator has chalked up at the Aetna Portland Cement Company's plant in Bay City, Michigan.

Installed in 1948, the rugged Worthington unit is the main source of power for this cement plant, operating at full load (often at 20% overload) in an atmosphere of highly abrasive dust.

One big reason why Aetna, like so many other leading industrial firms, chose Worthington is the undivided responsibility that goes with every Worthington turbine-generator. Both the Worthington turbine and generator are designed to operate as *one* unit and are assembled and completely tested *before* shipment.

For more facts about Worthington turbine-generators, write to Worthington Corporation, Steam Turbine Division, Section T.4.8, Wellsville, N.Y. T.4.8

"SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

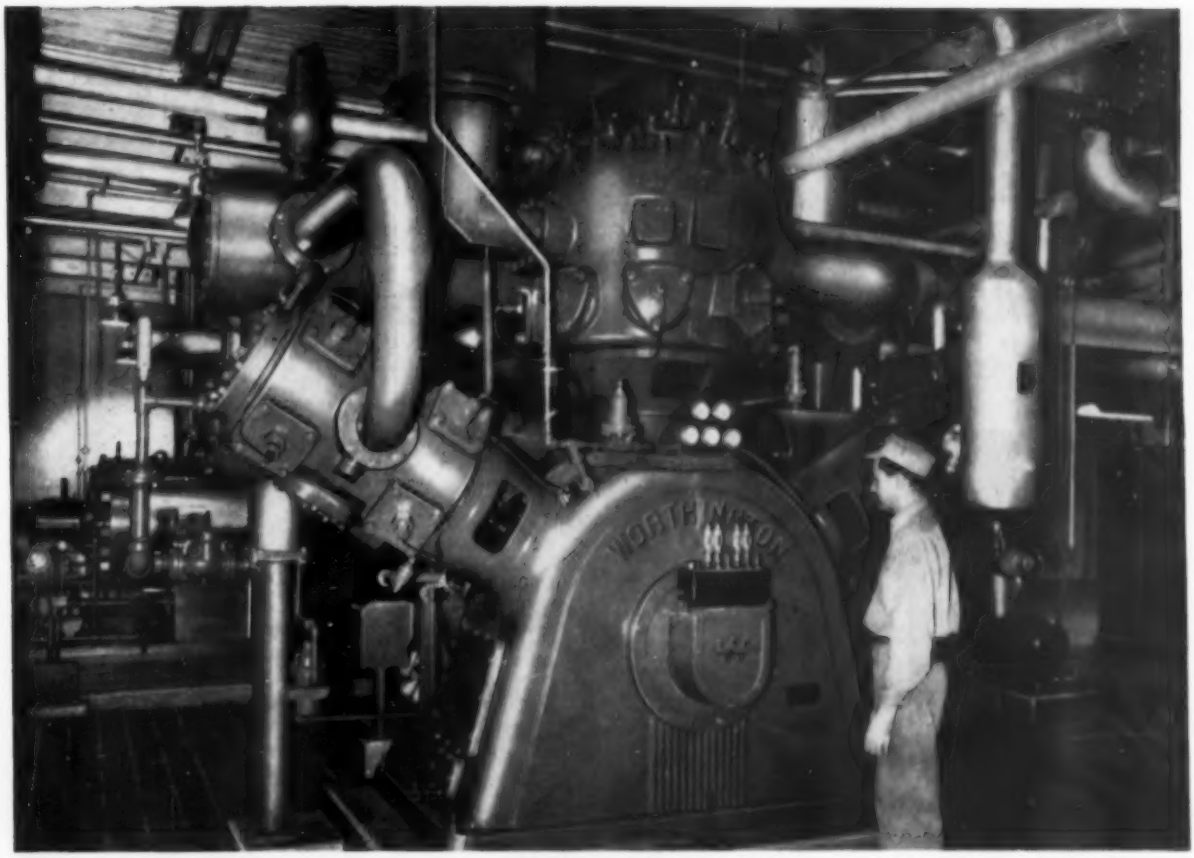
WORTHINGTON

STEAM TURBINES

Single- and Multi-Stage Turbines • Turbine-Generators • Deaerators • Boiler Feed Pumps • Surface Condensers

A GREAT TEAM IN STEAM

Circle 512 on Reply Card for more data



PENNSYLVANIA POWER COMPANY gets air for soot blowing from two Worthington DYC-3 air compressors at their New Castle Power Plant.

Which is better for soot blowing — steam or air?

If we asked that question 20 years ago, the answer would be steam. But today you'd be right if you said "compressed air."

Key to the success of compressed air in soot blowing was the development of simple, automatic controls. Not only can you pre-select an operation sequence for efficient cleaning, but you're sure that the cleaning operation will be complete — and carried on only at the most efficient pressure.

Here are more reasons for using air for soot blowing:

1. Lower-cost, low-pressure, low-temperature piping — with no piping insulation required.
2. Savings on feedwater make-up.
3. Reduced blower maintenance.

For a *dependable* supply of air for soot blowing, more and more power plants — both industrial and municipal — are specifying Worthington compressors. They're equipped with the exclusive Feather* Valve — the lightest, tightest, most efficient valve made. They're designed to give more air — at less cost.

Read our Bulletin L600-B14 — "Worthington Compressors for Soot Blowing". Write for it to Worthington Corporation, Water-Cooled Compressor Division, Harrison, N.J.

* Reg. U.S. Pat. Off. K.4.6

"SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

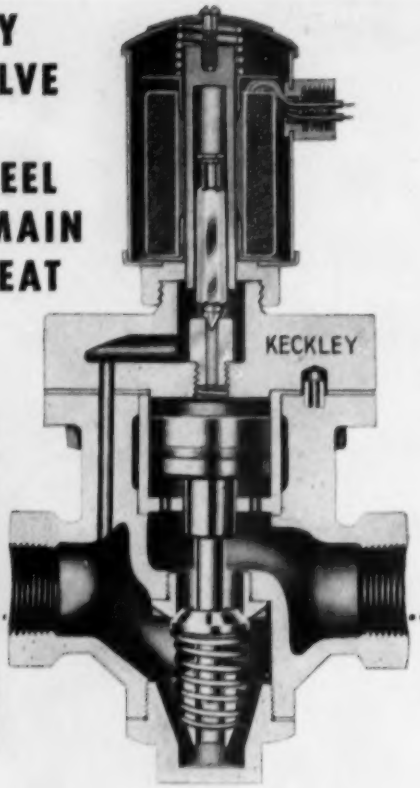
WORTHINGTON

Only Worthington Compressors give you Feather Valve Performance

Y-Types • Balanced Angle • Horizontal • Portable • Radial • Gas Engine Compressors

Circle 513 on Reply Card for more data

HEAVY DUTY SOLENOID VALVE WITH STAINLESS STEEL PILOT VALVE, MAIN VALVE AND SEAT



• The heavy duty pilot operated Type EA Keckley Solenoid Valve has many features not found in all solenoid valves. Simplicity of design has eliminated many wearing parts, and parts subject to wear are renewable. The piston is located above the flow eliminating any possibility of sediment scoring the cylinder liner. Valve body assembly is the same as Keckley Pressure Regulators of equal size—parts are interchangeable.

Incorporated into these valves are the best of materials and workmanship.

Order one for a test in your plant—no obligation. Write for details—Catalog 54-E.

SPECIFICATIONS

TYPE EA SOLENOID VALVES

Maximum Steam Pressure—250 lbs.
Maximum Air, Water, Oil and Gas Pressure—600 lbs.
Sizes ½" to 6" with Bronze or Semi-steel Bodies
Pilot Valve, Main Valve and Seat—Stainless Steel
Cylinder Wall—Bronze or Monel
Coils—Heavy Duty, Glass Insulated, Moisture Proof

O. C. KECKLEY COMPANY
400 W. MADISON ST.
CHICAGO 6, ILLINOIS

Pressure Regulators • Temperature Regulators • Float Valves
Strainers • Solenoid Valves • Reducing Valves
Pop Safety Valves • Relief Valves

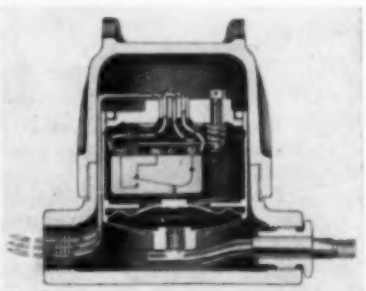
KECKLEY CHICAGO

Circle 514 on Reply Card for more data

new equipment

—Starts on page 8

A37 MOTORS—explosion-proof, Tri-Clad "55" motors, featuring extra protection for hazardous-location applications are announced by the Small Integral Motor Dept., of General Electric Co. Available in ratings from one to five hp, the new additions to G. E.'s line of NEMA rerated motors have heavier frame and end shield castings, and a special, machined-fit conduit box secured to the frame with four bolts. These motors are UL approved for Class I, Group D; and Class II, Group E, F, and G. Cooling fan is made of Textolite plastic to eliminate danger of sparking.

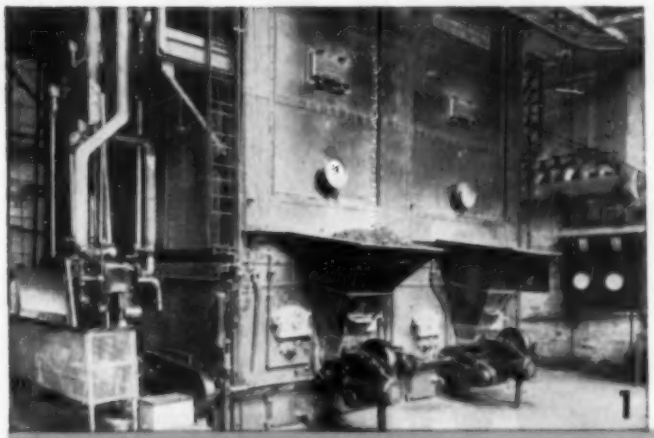


A38 SWITCHES—explosion-proof pressure and vacuum switches, introduced by Barksdale Valves, are enclosed in an explosion proof housing, UL approved for hazardous locations Class I, Group B, C, and D; Class II, Group E, F, and G. The switches cover the range from 30 in. of mercury to 150 psi pressure, sensing increasing or decreasing vacuum or pressure. Standard models are available for single or dual settings. The latter will secure two different limits and actuate two electrically

27 YEARS DEPENDABLE OPERATION

with Detroit Single Retort Stokers in the Cleveland Graphite Bronze Company

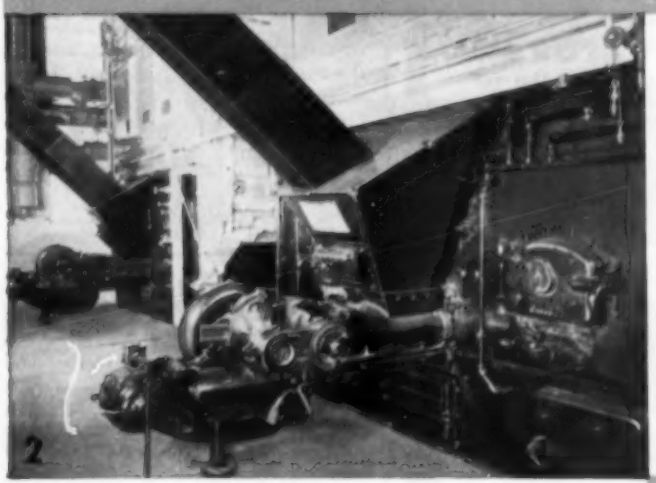
(Central Ave. Plant)



These old Detroit Single Retort Stokers have been operating for more than a quarter of a century and are still in excellent condition, giving satisfaction to the owners. Another typical example of Detroit Stoker durability.

Detroit Stokers are designed and built to outlast the boilers that they serve.

You can buy lower priced stokers but none that cost you less in the long run.



1. Steam engine driven Detroit Single Retort Stokers installed in 1927 at Cleveland Graphite Bronze Company Boiler Plant. Still giving efficient service.

2. Latest type Detroit Single Retort Stokers, individually motor driven, with Detroit Adjustable Feed Controls at Mumford High School, Detroit.

3. Detroit Adjustable Feed (Coal Feed Control) provides many rates of coal feed . . . is regulated either manually or automatically. Air supply from separate fan is properly proportioned to the coal feed for maximum efficiency at all capacities.

DETROIT STOKER COMPANY

General Motors Building—Detroit 2, Michigan

District Offices in Principal Cities • Works at Monroe, Michigan

DETROIT SINCE 1898 STOKERS

6923

Circle 515 on Reply Card for more data

LOW COST PROTECTION for EXPENSIVE EQUIPMENT

WA Standard with STEAM USERS SINCE '94

A nominal investment in well engineered accessories will protect your major capital investment in power equipment. Wright Austin has served industry conscientiously for 60 years —offers you the confidence and peace of mind that comes from knowing you are using proven designs.

Catalog 500 covers the line of separators, purifiers, exhaust heads for steam, air and gas.

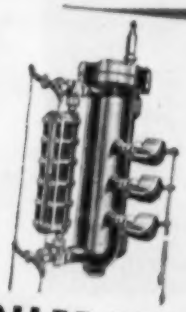
SEPARATORS

Installation of the compact 31-N and other W-A separators and purifiers will guarantee freedom from damaging entrainment, oil, rust, scale and condensate in your power lines.

STEAM TRAPS

Operation of W-A traps is simple, fool-proof. Installation has been made easy and service can be performed with minimum effort and time.

Catalog 600 describes the wide range of W-A traps for steam, air and gas.



BOILER TRIM

Provisions for greater safety to equipment and worker plus peak efficiency is available at low cost in this line of 16 accessories.

Catalog 700 describes the complete line of alarms, gauges, controls, etc.

WA WRIGHT-AUSTIN COMPANY WA

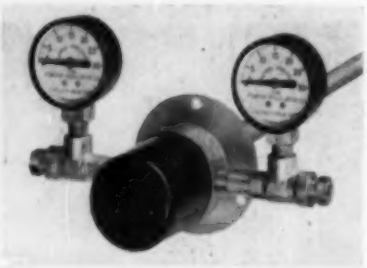
3245 WIGHT STREET • DETROIT 7, MICH.

Circle 516 on Reply Card for more data

new equipment

—Starts on page 8

independent circuits, one ac and the other dc if desired. All models repeat within ± 1 percent of settings.



A39 THERMOSTAT—non-bleed pneumatic temperature control, known as the Limitem, is announced by The Powers Regulator Co. for operation of such devices as diaphragm valves, damper motors, and other types of control equipment. A differential expansion type control designed for precision regulation of heating, cooling, ventilating, and industrial processes, the unit has a temperature range of 35 to 135 F. Graduated dial permits easy adjustment from ⅛ to 2 psi per one deg temperature change—gradual acting. Literature is available.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

A40 FLEXIBLE CABLES with from 5 to 24 conductors are announced in sizes 18 through 10 AWG by Western Insulated Wire Co. Known as the Bronco 60 Certified, the cables are made of pure, annealed, electrolytic copper for flexibility and long flex-life. Insulation over conductors is heat resistant type RH rubber. Singles are coded with permanent colors. Name, type, size, number of conductors, rated voltage, and flameproof approval number of the U. S. and Pennsylvania Bureaus of Mines are vulcanized permanently into the protecting sheath.

STRENGTH

for Safety and Long-Time Service

For 2000, 3000 and 6000 pounds service — Sizes 1/8" to 6"

SCREW END TYPE

For schedules 40, 80 and 160 pipe — Sizes 1/8" to 4"

SOCKET WELD TYPE

Vogt Ells, Tees, Crosses, etc., are forged from carbon steel or various alloys to meet specific operating conditions. Catalog F-9 will aid you in their selection and proper application.

Shocks and stresses imposed by high pressures and high temperatures are taken in their stride because Vogt fittings are uniform in structure, fine grained, and free from porosity . . . the superior product of laboratory controlled materials and giant forging hammers and upsetters. These properties also give higher resistance to erosive and corrosive conditions, thereby adding to service life expectancy in steam plants, petroleum refineries, chemical plants and related industries.

HENRY VOGT MACHINE CO., INC.
Louisville 10, Kentucky
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

Vogt

DROP FORGED STEEL FITTINGS

Circle 517 on Reply Card for more data

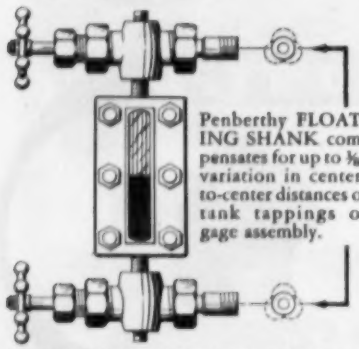
PENBERTHY GAGE VALVES WITH

FLOATING SHANK

SAVE TIME and TROUBLE

Take a look at the tail pipe of the valve pictured here. Notice that it is adjustable in relation to the body of the valve.

This "floating" feature adds flexibility in mounting. It compensates for inaccurate center-to-center gage assemblies or variations in tank tappings... up to ⅛". Since a normal gage and valve assembly involves four threaded connections, the time saved in installing is appreciable. In addition, mounting stresses are eliminated.



Penberthy FLOATING SHANK compensates for up to ⅛" variation in center-to-center distances of tank tappings or gage assembly.

The FLOATING SHANK principle is a patented feature available only on Penberthy Gage Valves and at no extra cost. Ask your supplier to furnish these valves for *all* your gage requirements — new installations and replacements. Use the coupon to obtain detailed information on the Penberthy line of Liquid Level Gages and Gage Valves.

PENBERTHY

PENBERTHY INJECTOR COMPANY
Division of Buffalo-Eclipse Corporation
1342 Holden Avenue, Detroit 2, Michigan

Please send Catalog #35 to:

Name.....*Title*.....

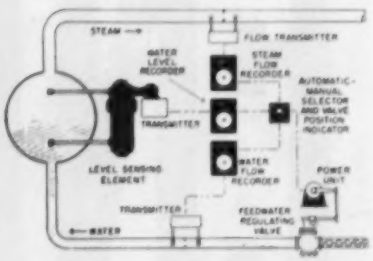
Company.....

Address.....

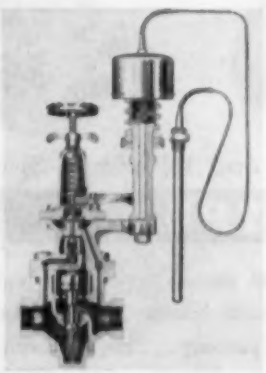
.....

new equipment

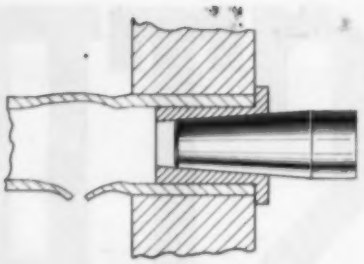
—Starts on page 8



A41 CONTROLLER—One, two, and three element feedwater control systems have been developed by The Hays Corp. to meet requirements of large, medium, or small boilers under normal or severe operating conditions. Electronic operation of the controller provides speed of transmission, high accuracy of control, and is independent of effects due to normal variations in voltage and frequency. Present instruments can be utilized and pressures up to 2500 psig can be accommodated. Features include positive valve drive, mercury-less measuring and transmission for flow and level, and direct level measurement.



A42 REGULATOR—A Type PTM modulating pressure-temperature regulator has been added to O. C. Keckley Company's line of steam and liquid control equipment. Body of the regulator is bronze or semi-steel and pilot valve, main valve, and seat are of stainless steel. All wearing parts are renewable. It is available in six temperature ranges in sizes ½ to 2 in. with screwed ends and 2½ to 6 in. with flanged ends. Minimum of 10 lb pressure differential is required to operate the valve.

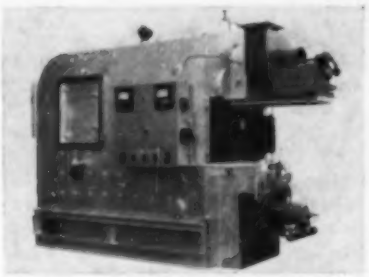


A43 EMERGENCY PLUGS—Operators of condensers and heat exchangers will find the Elliott Tube Plug handy in an emergency. The plug consists of two pieces: a brass bushing with collar, which is a close fit in the tube; and a steel plug, made with a slight taper to fit the inside taper of the bushing, which is then driven into the bushing. Expansion of the bushing or sleeve makes a tight fit and no damage can be done to the tube sheet. Lagonda Div., Elliott Co. has designed the plug for parallel expansion.

A44 A SWITCH that combines both interlocking and non-interlocking switch features in one unit has been developed by the Frank Adam Electric Co. Known as the Type SCSD Standard Duty Closed Shutlbrak Switch, it is UL approved for label service and can be used for motor control, service entrance, or any job requiring a standard duty operating switch. The units are available in the following capacities: 30 to 200 amp, 250 and 600 v ac or dc, 2, 3, and 4 poles single throw.

A45 DISTRIBUTION transformers with improved electrical characteristics and sealing, fewer parts, and, in the larger ratings, smaller size are announced by Westinghouse Electric Corp. They are built in single-phase ratings from 3 to 167 kva, 15,000 v and below.

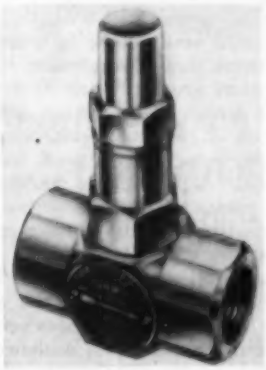
Three-phase ratings range from 9 to 150 kva, 15,000 v and below. Larger ratings are designed to have shortest possible wall heights and meet EEI and NEMA requirements.



A46 PACKAGE BOILERS of the water-tube type, fire-box design have been developed by International Boiler Works Co. for low and high pressure requirements: sizes 32 through 500 hp and 20 through 600 hp, respectively. Units can be equipped with automatic overfire draft controls for oil, gas, or combination firing. All that is necessary to install the boilers, known as the Compak line, is to connect utilities; pipe to main steam outlet; and short stub stack to fan outlet.

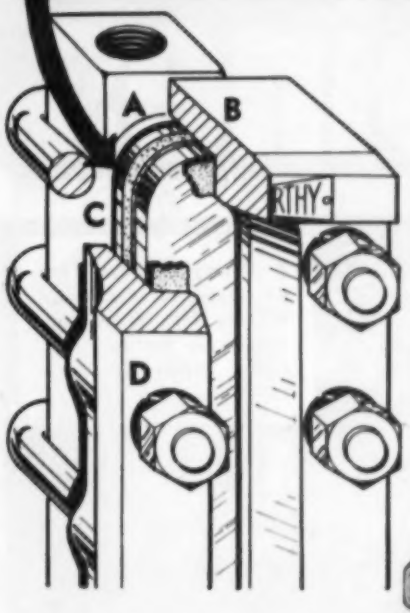
TO GET MORE INFORMATION

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.



A47 IMPULSE STEAM TRAP designed with low capacity to handle light condensate loads, the Yarway 20-A introduced by Yarnall-Waring Co. will not freeze or air bind on steam tracer line service. The ½ in. trap features small size, low cost, and body and all working parts of stainless steel. The valve operates at pressures to 400 psi.

"RAISED FACE" OF PENBERTHY GAGES OFFERS EXCLUSIVE ADVANTAGES



A. Perfect alignment of frame with glass and gasket assured... leaks or glass breakage minimized.

B. Cover completely encloses sides and ends of glass and gasket, thereby preventing blowouts and danger of accompanying hazard.

C. For high pressure service the close fit over raised face gland resists distortion of cover due to bolt loading stresses.

D. Drop-forged steel frame, heat-treated alloy steel liquid chamber and bolts withstand rugged service conditions.

In Addition to These Operating Advantages, Benefits in Field Service Include . . .

- Easy glass or gasket replacement and gage cleaning facilitated by fully accessible RAISED FACE.
- Correct alignment in reassembly.
- Repair of gasket surface without removing assembly from vessel.

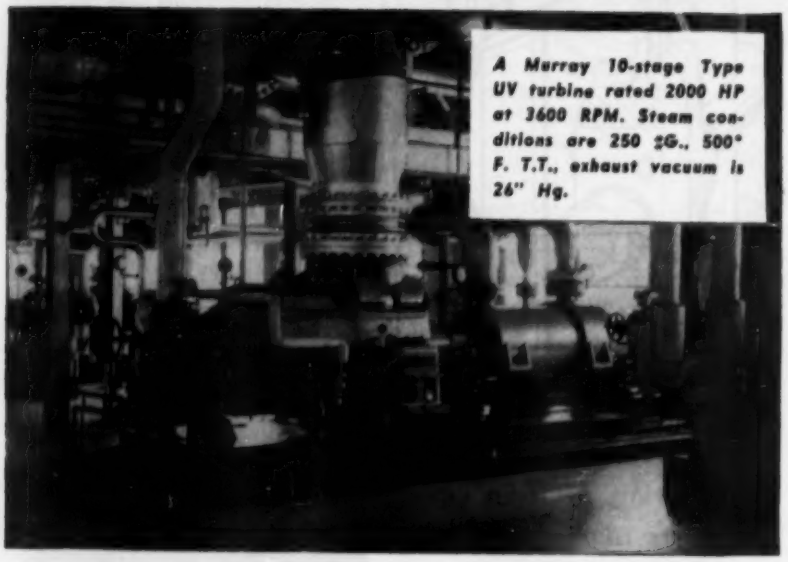
Reason enough for you to investigate the use of Penberthy gages in your operation. Complete units and replacement parts are stocked by leading suppliers. Use the coupon on the facing page to obtain more detailed information.

There's Certain satisfaction in **PRODUCTS BY** PENBERTHY

- CYCLING JET PUMPS
- EJECTORS
- INJECTORS
- ELECTRIC SUMP PUMPS
- EDUCTORS
- EXHAUSTERS
- SYPHONS

Circle 518 on Reply Card for more data

Murray Turbines



A Murray 10-stage Type UV turbine rated 2000 HP at 3600 RPM. Steam conditions are 250 #G., 500° F. T.T., exhaust vacuum is 26" Hg.

● The Murray Type UV turbine pictured above has been driving a high pressure lean oil pump in a Southwestern refinery for the past 10 years and is still giving dependable, trouble-free service.

Murray mechanical drive turbines both single and multi-stage can be furnished in a wide range of ratings for steam pressures ranging from 0 to 600 #G., condensing and non-condensing. Types in the higher pressures available for up to 250 #G. back pressure.

MURRAY IRON WORKS COMPANY
BURLINGTON, IOWA

BUILDERS OF STEAM POWER EQUIPMENT FOR THREE QUARTERS OF A CENTURY

Circle 519 on Reply Card for more data

letters

. . . from readers

Confused?

Dear Sir:

The Dec., '54 issue of INDUSTRY AND POWER carried an article on page 56 titled, "Do You Have True Voltage Control," written by Mr. Harold E. McConnell.

The article does a fine job. . . . However, at several points in the article, statements were made which I believe could be rather confusing to anyone not as thoroughly familiar with the subject as is the author. Reference is made on page 57 to automatic voltage regulators . . .

After study of the article, I came to the conclusion that ... the author was referring to the so-called "stabilizer" type of voltage regulating equipment which is extremely fast in its operation. However, there are several other types of automatic voltage regulators manufactured that are very efficient and are applicable in heavy power distribution. These are the induction and step-type voltage regulators. They are available as completely automatic regulators and are capable of maintaining the voltage within very close limits.

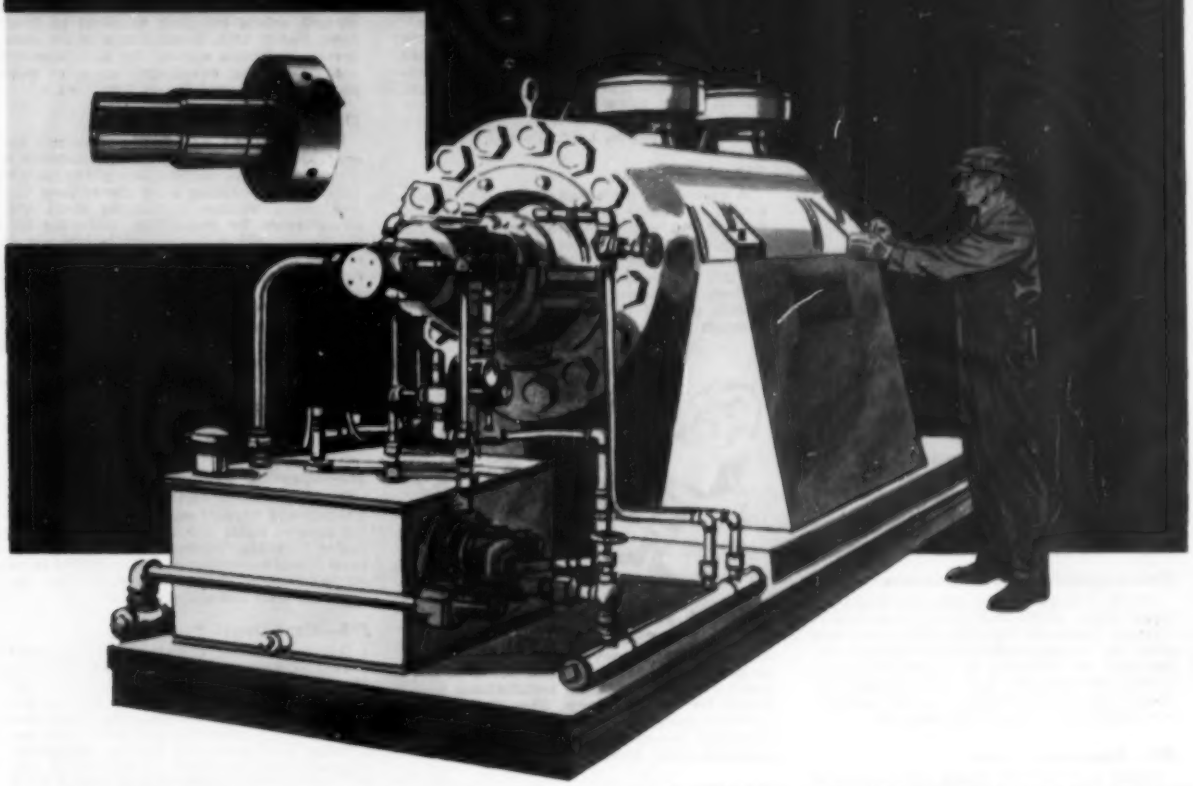
... the author does discuss the use of the induction or step-type voltage regulator, but he neglects to point out that it is not the same type of regulator to which he had previously referred. It appears that anyone not fully acquainted with the subject could easily come to erroneous conclusion that all automatic voltage regulators are inefficient or useless.

The author discusses on page 58 the use of automatic-tap-changing transformers... The need for the automatic-tap-changing transformer on a modern industrial power system results from the voltage spread in the source voltage rather than voltage drop within the plant. Thus, it is quite possible that the automatic-tap-changing transformer may be required in the best designed industrial power distribution system.

The author does point out later the possible need for the automatic-tap-changing transformer in the design of a system using high reactance (high voltage) transformers.

W. R. Crites
Power Systems Engineer
Industrial Engineering Section
General Electric Company
Schenectady, N. Y.

Now... BJ mechanical seals for high pressure boiler feed pumps!



Another Byron Jackson first!

- **No operating adjustment**
- **Stop liquid loss**
- **Reduce heat loss**
- **Save downtime costs**
- **Cut replacement costs**

BJ . . . the pacemaker in mechanical seals for pumps . . . now has pioneered the first successful application of the mechanical seal to high pressure boiler feed pumps. These new BJ Mechanical Seals are now in operation in a number of high pressure, hot water pumping operations, including temperature up to 430° F. These seals—some in service as long as three years—have paid off in performance. They have minimized heat and liquid loss, eliminated frequent repacking problems, and simplified maintenance since no operating adjustment is required. Find out how these new BJ Mechanical Seals for boiler feed pump service can benefit you. Contact your nearby Byron Jackson office or write.

You'll do better with BJ

Byron Jackson Co.

Since 1872

P. O. BOX 2017, TERMINAL ANNEX, LOS ANGELES 54, CALIFORNIA

Circle 520 on Reply Card for more data

new bulletins

. . . catalogs from leading manufacturers

200—Underfloor Heating Systems

"Install Underfloor Heating Systems at 25 Percent Saving. . .," four-page folder tells how Ceramiduct, a clay product for perimeter and radial underfloor slab heating duct systems, can save you money. Typical installations are shown with cross-section diagrams and photos. Straitsville Brick Co.

201—Sintered Material

"Steel Oilite," four-page folder, gives complete data on a new sintered material. The bulletin points out that precision finished machine parts can be made from Steel Oilite with over 10 percent ductility and greater impact resistance and fatigue strength. Physical properties, savings with use of the material, and other advantages are listed. Amplex Div., Chrysler Corp.

202—Heat Transfer Products

The complete line of heat transfer products available from this company are included in seven bulletins which have been incorporated into one catalog. These include convectors, unit heaters, air conditioning equipment, heat exchangers, torque converter coolers, and specialties. This is a good opportunity to add to your engineering data file all the information on these products in one folder. Young Radiator Co.

203—Air Preheater

"The Ljungstrom Air Preheater," 36 page catalog, describes the Ljungstrom—what it does, how it works, and how it can serve you best. Specific suggestions for your particular plant layout are shown in detailed drawings. The Air Preheater Corp.

204—Liquid-Filled Transformers

Physical and electrical characteristics for liquid-filled, single and three phase transformers from 750 through 10,000 kva are given in 16-page engineering manual 133. Sections are included on standard accessories, performance data, dimensions and weight, terminal arrangement, and optional accessories. R. E. Uptegraff Mfg. Co.

205—Expansion Joints

Relief of stresses in piping installations is possible with use of Rubber Expansion Joints, according to four-page folder 250-W. Round, square, rectangular, oval, taper, and special shapes for pressure, vacuum, or pressure and vacuum are described. La-Favorite Rubber Mfg. Co.

206—Circulating Pumps

Users of circulating and coolant pumps will be interested in 19-page bulletin 7074-D which shows the entire line of Class KRV and KRVS Motorpumps as set up with totally enclosed motors. Pictorial index makes it easy to turn to the page containing size and type of pump suited to your need. Horizontal and vertical units are described in fractional and integral hp sizes. Ingersoll-Rand Co.

207—Aftercoolers

Wet air fouls tools, produces waterhammer, corrodes pipes, freezes, and in general reduces the efficiency on any job where it is used. According to four-page folder 1, wet air can be avoided by the simple installation of the Hamilton aftercooler system. Labeled cut-away view shows working parts and explains how the system operates. A complete specifications chart is included. Jas. A. Murphy & Co.

208—Pipeline Cooling

"A Solution to the Problem of Deposits in Piping Systems," four-pages, describes the three principal methods used in cleaning lines: chemical, pipe line pig, and jet moles. Case histories from industry are given to demonstrate where the various methods should be used. Dowell, Inc.

209—Lubrication

A system of single and multi-point application of liquids to a wide range of metal cutting and forming operations is described in eight-page bulletin 491. An adaptation of oil-fog principle of lubrication developed by this company, the Norgren spray-lube system is shown in typical application photos with data on advantages realized through its use. C. A. Norgren Co.

210—Lick Scrap Metal

"Eriez Non-Electric Permanent Magnetic Separators for Removal of Unwanted Iron," 16 pages, is a detailed compilation of the many types of magnetic installations produced by this company. This Catalog 17 provides complete information on the installation, technical data, specifications, and available sizes. Eriez Mfg. Co.

211—V-Belts

"Three Reasons Why Gates Vulco Ropes Wear Longer . . . Cut V-Belt Costs," two-page sheet, explains why concave sides are important to long V-belt wear. Cut-aways and sketches demonstrate the advantage of this type of construction. Table of outside circumferences with dimensional drawings is included. Gates Rubber Co.

212—Vibration Isolators

Features and uses of the Type 5200 shock and vibration isolators are given in eight-page booklet 541. Graphs give data for isolator loads, shock transmissibility, vibration transmissibility, and coupled natural frequencies. Attachment and installation instructions are provided. The Barry Corp.

213—Air Traps

Methods of selecting and installing air traps for automatic drainage of water from compressed air intercoolers, aftercoolers, receivers, separators, and drip points are explained in four-page bulletin 2022. Also shown are detailed drawings and physical data of ball float, inverted bucket, and air traps. Armstrong Machine Works.

214—Crown Couplings

All the information you need to select the correct crown coupling is given in four-page folder 2203. Illustrations show compression stresses caused by misalignment and how these couplings can solve such problems. De Laval Steam Turbine Co.

215—Voltage Stabilizers

Electronic and electrical equipments require a high degree of voltage stability if they are to give satisfactory performance. This 16-page catalog 4-200 shows how this company's voltage stabilizers meet this requirement by regulating incoming line voltage to within ½ percent in 1/20 sec. It also describes the various types of stabilizers currently available. Raytheon Mfg. Co.

216—Maintenance Program

"Get Better Maintenance," 28-page bulletin, presents a comprehensive program for planning and controlling plant maintenance. It discusses eight basic points that constitute a complete maintenance program: organization, personnel, facilities, methods, scheduling, controls, reports, and policy. Anderson-Nichols & Co.

217—Cooling System Water

Dangers of scale and corrosion in cooling systems and organic contamination of cooling system water are outlined in six-page folder "Cooling Water." It describes solutions found to cooling water problems in an oil refinery, a steel plant, and other industries. Hall Laboratories, Inc.

218—Centrifugal Pumps

Detailed parts drawings, dimensional drawings, and performance charts for each of six standard models of Impervite impervious graphite centrifugal pumps are given in six-page bulletin 854. Also discussed is the virtually leakproof seal developed and produced by the company. Chemical and physical properties of Impervite impervious graphite are listed. Falls Industries, Inc.

219—Fans and Ventilators

Designed primarily for engineers and plant maintenance men, this eight-page catalog 60M contains technical data and capacity ratings with photos of Penn's line of propeller fan, centrifugal, stationary, rotary, and ridge roof ventilators, and accessory products. Performance and capacity tables will prove of particular value. Penn Ventilator Co.

220—Dust Control

Engineers of power plants burning pulverized coal and plant engineers of dry chemicals plants using large volumes of exhaust air will want to have dust control bulletin 291. The outside-in twist (the reverse of the normal tangential flow of most centrifugal dust collectors) for higher efficiency over a wide range of air volumes is

Continued on page 38

NOTE — Each new bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

HEAVY STEEL FABRICATORS

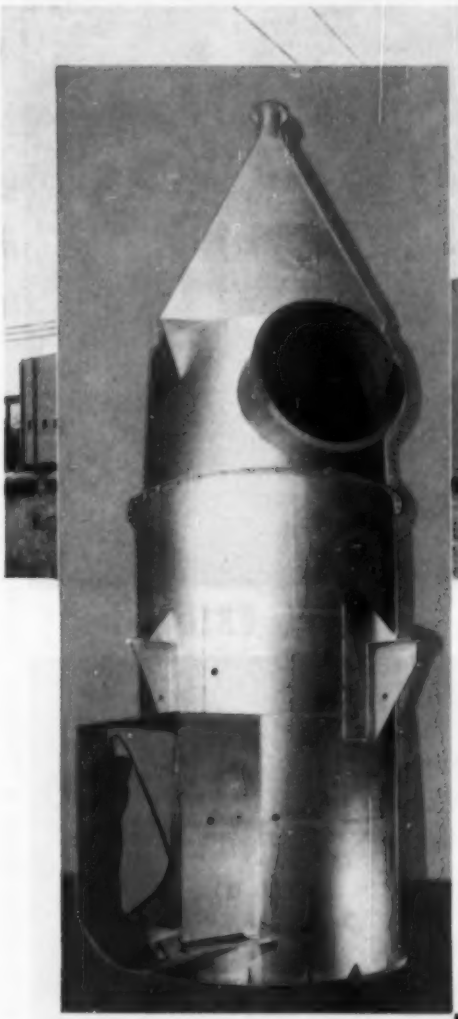


Photo at left shows one of two cooling chambers, integral components of vortex type dust collectors. Special design by Grindle Corporation eliminates dust, fumes, general smoke nuisance from expanded cupolas and stacks of major Detroit automobile manufacturer.

THE foster COMPANY

designers and fabricators of precision steel weldments

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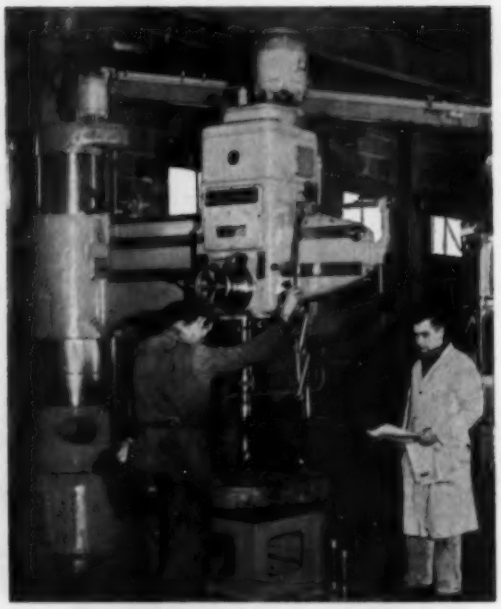
MODERN HEAVY EQUIPMENT ASSURES



RADIAL DRILLS

SQUARING SHEAR

PRESS BRAKE

PRESS BRAKE, 400 Ton capacity, for forming and bending. Also equipped with demountable bed and ram flanges for gang punching or heavy progressive die work.

PRECISION WELDMENTS AT LOWER COST

RADIAL DRILLS

RADIAL DRILLS, for heavy duty, high speed drilling, reaming, tapping, counter boring and similar operations.

SQUARING SHEAR

SQUARING SHEAR, ¾" x 10' capacity, for accurate blanks. Also equipped with adjustable ram for notching and slitting special shapes of unlimited lengths.

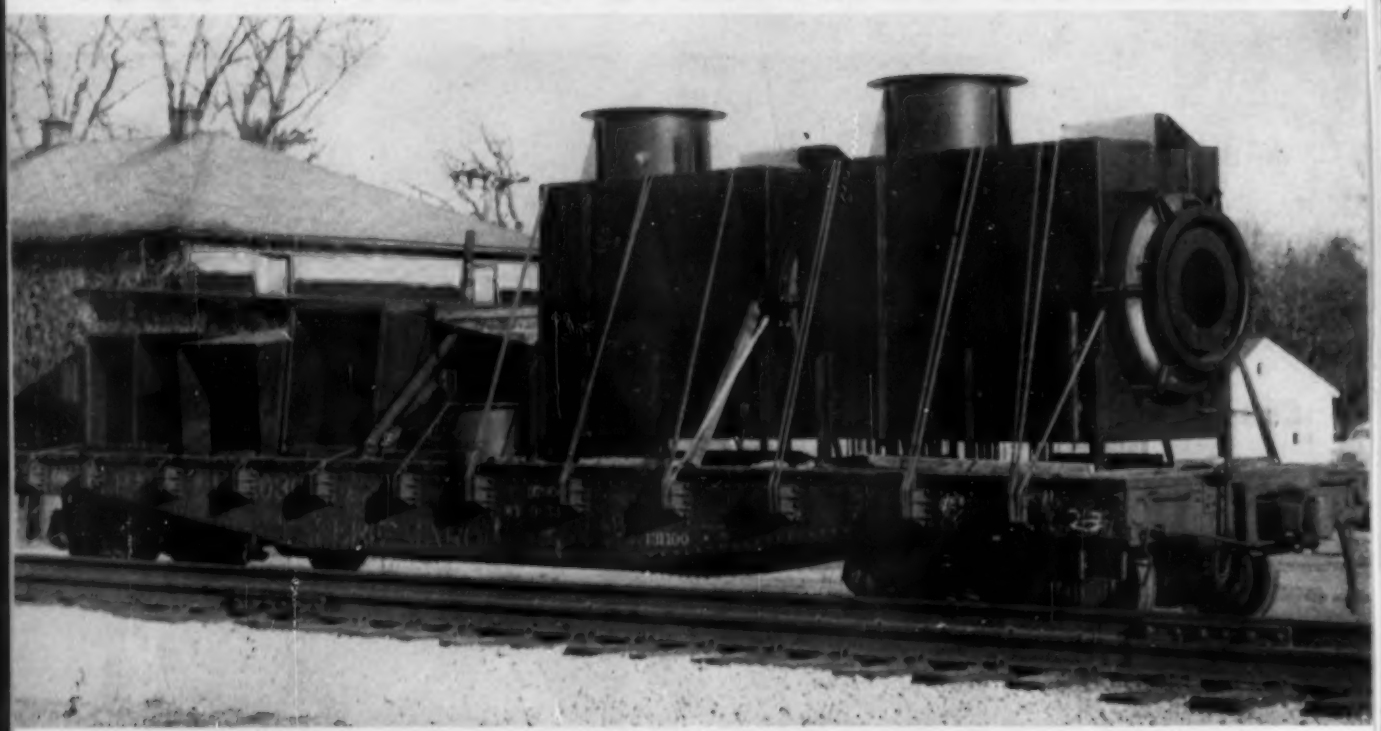
FLAME-CUTTING MACHINES

FLAME-CUTTING MACHINES, for cutting complex patterns, such as gears, cams and other intricate shapes—of unlimited thickness. Tolerances as low as five-thousandths can be maintained, reducing costly machining operations to a minimum.

BLASTING ROOM

AIR BLAST room for cleaning and peening weldments, removing mill scale and annealing scale, and preparation of material for painting or rubber covering. Pressure tank and hopper (in pit, not shown) provide continuous blast of steel shot thru ¾" nozzle. All operating components American Wheelabrator.

Better Products at Lower Cost—by Fabrication



These pressure burners, especially constructed for U.S. Steel Corporation blast furnace stoves, are an example of *precision* weldments. Double copper expansion rings, visible at extreme right center in photo above, expand and contract with variations of temperature to assure tight seal between stove body and tapered nozzle. Perfect radii avoid pulsation in complex baffling system. All weldments are gas-tight.

THE foster COMPANY

St. Joseph, . . . Michigan

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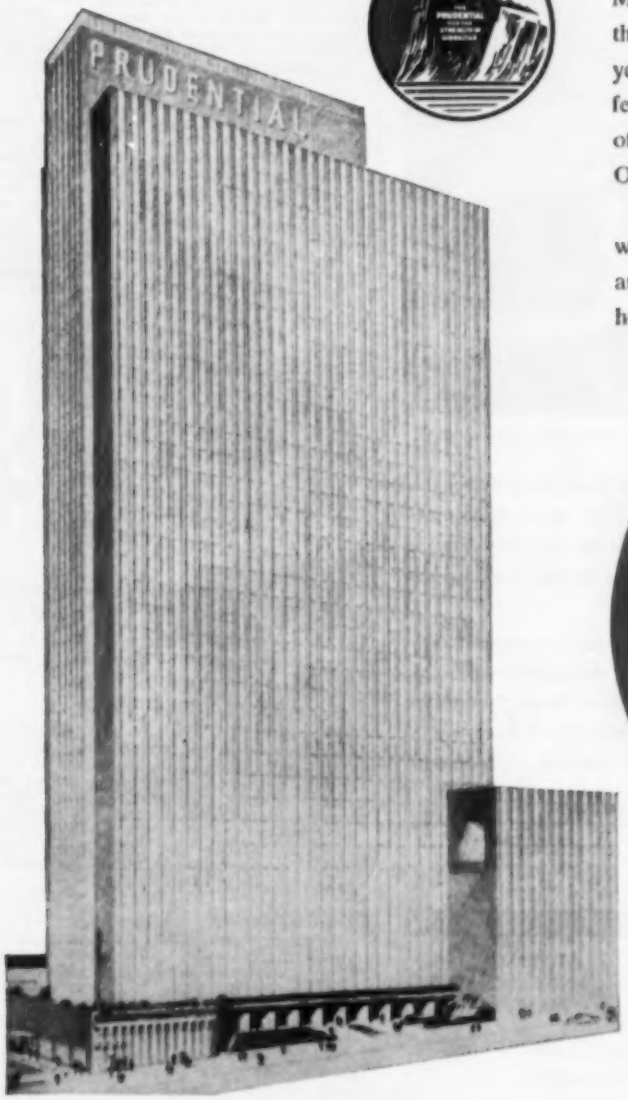
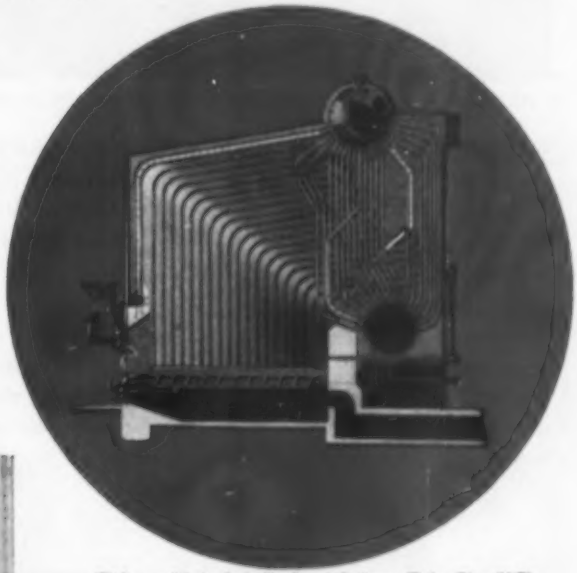
ERIE CITY *boilers used by* Prudential in CHICAGO



NAESS & MURPHY, Architects and Consulting Engineers
L.J. SHERIDAN & CO., Renting Agents

Modern, Erie City VC Steam Generators will satisfy the heating load for the most modern office building yet projected. The Prudential Building, soon to rise 600 feet into the Chicago skyline, is the very last word in office facilities. Prudential's new Mid-America Home Office is one of the largest office buildings in Chicago.

Erie City VC's, the last word in compact, completely water cooled steam generators will provide flexibility and economy of operation in meeting a variable steam heating load.



This multiple installation of three Erie City VC's, fired by Detroit spreader stokers, features completely water cooled furnaces—offers high capacity in a compact design. Erie City VC's save space, economize installation and maintenance costs. They permit a high degree of flexibility and quick response to load changes. Request Bulletin VC-4.

ERIE CITY
Years in Steam Generating

You can depend on Erie City for sound engineering

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

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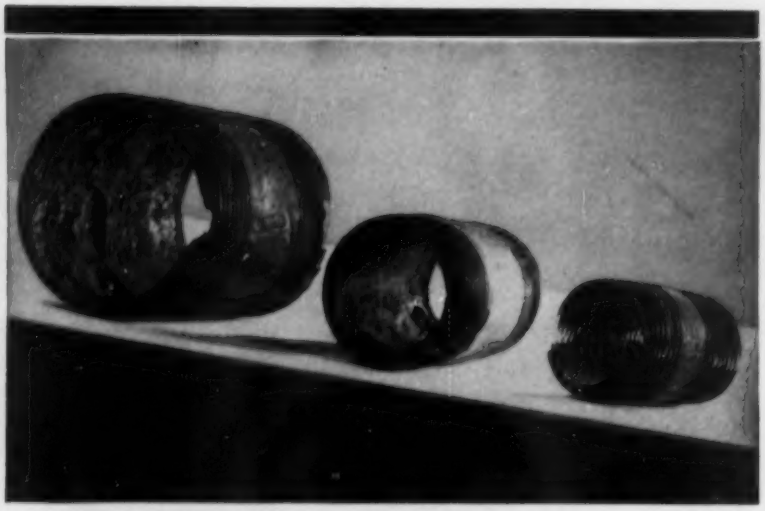
STOP CORROSION
with BIRD-ARCHER AMINE TREATMENT



Unretouched photograph shows the ravages of corrosion on condensate return lines.

Corrosion of piping in steam and condensate return lines is an expensive two-way headache. (1) It leads to large outlays for pipe replacement and maintenance. (2) It often results in plugged return lines and traps due to the solid products of corrosion. Bird-Archer Amine Treatment effectively eliminates these troubles at low cost.

Here's how. Amines are fed into the boiler or into the steam and condensate systems. The amines raise the pH value of the condensate and also tend to inhibit equipment-destroying corrosion through surface protection of the metal itself. In scores of plants, this Bird-Archer system has more than paid for itself by substantially cutting replacement and maintenance costs.

8A-902

Bulletin CP 100 gives all the facts on Bird-Archer Amine Treatment. Write for your copy.

LABORATORIES ENGINEERS • CHEMISTS

BIRD-ARCHER
WATER TREATMENT

THE BIRD-ARCHER COMPANY, 4337 NORTH AMERICAN ST., PHILADELPHIA 40, PA.
NEW YORK • CHICAGO

IN CANADA: The Bird-Archer Co., Limited, Cobourg, Ontario
IN MEXICO: Calderas y Accesorios, S. A., Amsterdam 291, Mexico, D. F.

Circle 523 on Reply Card for more data

new bulletins

—Starts on page 32

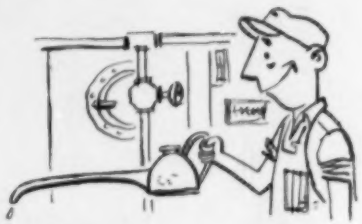
explained. The AMERclone dry granular dust collector is shown in cross section and by means of a flow diagram. American Air Filter Co., Inc.

221—Controllers

"ElectroniK Circular Chart Pneumatic Controllers," specification sheet 163-1, lists complete specifications for these instruments, and furnishes an up-to-date listing of the control forms available. Industrial Div., Minneapolis-Honeywell Regulator Co.

222—Detector Systems

"Electro-Graphic Detector Systems," six-page booklet, describes a recent development by Barnes' engineers for simplifying maintenance of complex electrical controls. It presents a detailed description of the general design principles and operation of the Detector and describes how these systems may be readily tailored to fit a wide variety of applications where machine downtime may seriously impair over-all plant efficiency. W. F. & John Barnes Co.



223—Lubricant

Sunoco Way Lubricant, a special lubricant for the ways of machine tools, is described in two-page technical bulletin. Causes of slip-stick or jumpy table, as it is sometimes called, are explained. Sun Oil Co.

224—Fluid Couplings

Complete with diagrams and drawings, 12-page bulletin 144-D shows the ease of applying Twin Disc Fluid Couplings on any type of industrial equipment, powered by any type electric motor or internal combustion engine from ¾ to 850 hp. Installation hook-ups provided by the broad variety of fluid couplings are given along with typical on-the-job applications in various industries. Twin Disc Clutch Co.

225—Insulation

Six-page folder IN-150A presents the facts about Thermoflex, a refractory-fiber felt. It contains tables and information on the low conductivity factor, sound absorption qualities, chemical and thermal stability, and other characteristics of this versatile new product. If you are concerned with problems involving control of high temperatures, the properties listed may suggest solutions. Johns-Manville.

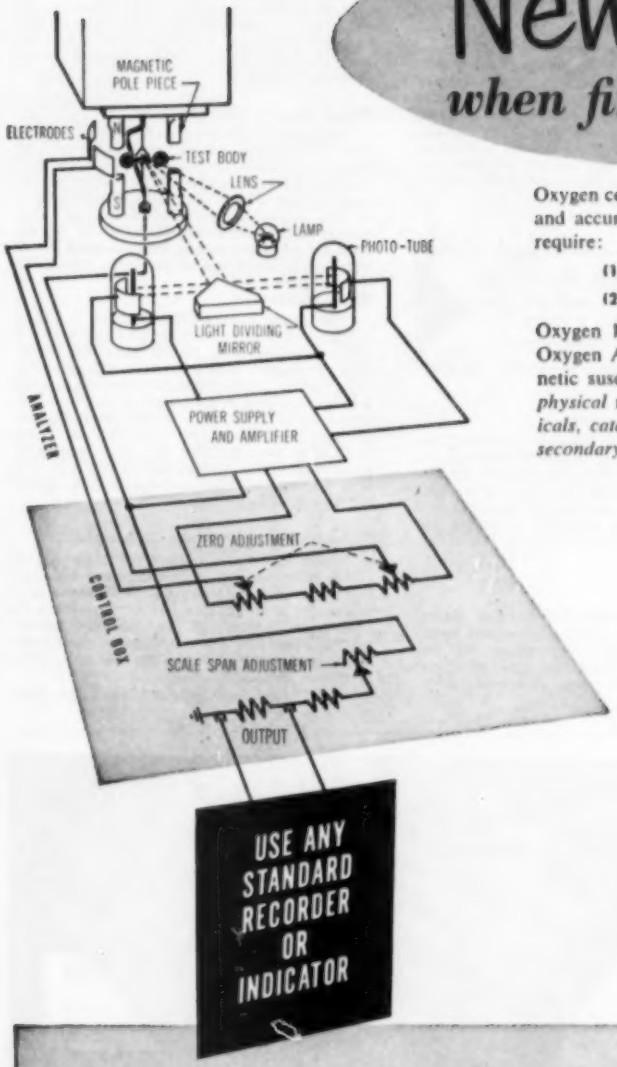
226—Pumps

Vacseal pumps for handling of abrasive pulps and corrosive solutions are described in 15-page bulletin PB-52. All metal and rubber lined types are included with drawings of general pump dimensions, capacity tables, assembly drawings, and parts lists. The Galigher Co.

227—Stainless Steel Piping

Engineers and designers concerned with problems involving stainless piping will find valuable data in six-page bulletin TB-356.

New Savings...
when firing with any fuel!



Oxygen content of the flue gases is generally recognized as the most direct and accurate index of correct air-fuel ratio. Optimum results, however, require:

(1) An Analyzer that is accurate, dependable, field-proven.

(2) A Sampling System that is simple, responsive, trouble-free.

Oxygen has a high magnetic susceptibility. The Arnold O. Beckman Oxygen Analyzer is the ONLY oxygen analyzer that measures total magnetic susceptibility directly. It is the ONLY Analyzer providing a *direct physical* measurement of the oxygen content itself. *No filaments, chemicals, catalysts, glassware or other complications found in conventional secondary methods of measurement are required!*

As shown at left, a small dumbbell is suspended in a magnetic field. The sample gas surrounds this dumbbell. If the sample gas contains oxygen, it is drawn into the magnetic field, causing the dumbbell to rotate into or out of the magnetic field, *depending directly upon oxygen content of the gas itself.* A beam of light, reflected by a mirror attached to this dumbbell, actuates phototubes. With simple electrical circuits, the dumbbell is repositioned to its null point by a voltage. This voltage is proportional to the oxygen content and can operate any standard recorder or indicator. *It's as simple and positive as that!*

This revolutionary Analyzer permits a completely new approach in Arnold O. Beckman Sampling Systems and accessory equipment — systems carefully engineered to meet the most difficult requirements of the power industry. They are unusually simple, trouble-free, and readily adaptable to various operating requirements.

Get the full story on this remarkable new advancement in Oxygen Analyzers. Write for Data File 10C-15. No obligation, of course.

Features of the Beckman Model F-3

SELECTIVITY Highly sensitive to oxygen. Effects of gases other than oxygen are negligible.

MANY RANGES Combustion ranges include 0-5%, 0-10%, 0-15%, and are provided with a second range of 0-25%. Other ranges up to 0-100% O_2 are available. Calibration of the Model F-3 is strictly linear and scale is accurate over the entire range.

HIGH ACCURACY ± 1% of full scale for spans of 5% and greater. Accuracies within .05% O_2 on 0-5% range are available.

AIR CHECK Simple positive check of proper operation by recording the air point on the second range.

SIMPLE SAMPLING Independent of flow rate. Nothing is added to the sample. The sample may be dry or saturated. Corrosive gases will not poison the instrument. Only a small sample (3-15 cu. in./min.) is required.

LOW MAINTENANCE Completely insulated against extreme shock and vibration. No chemicals, no catalysts to replenish. No wicks, filaments, orifices, valves, etc., to clean and replace.

STANDARD RECORDERS Any standard industrial potentiometer recorder or pneumatic receiver can be used.

Arnold O. Beckman INC

Manufacturers of Industrial and Scientific Instruments

1020 MISSION STREET

SOUTH PASADENA, CALIFORNIA

Circle 524 on Reply Card for more data

new bulletins

—Starts on page 32

It outlines methods of bending and joining stainless pipe and discusses the problems of light wall versus heavy wall pipe with tables of dimensions and weights of various stainless pipe size schedules. The Babcock & Wilcox Co.

228—Side Dump Stokers

Side dump stokers with Moving Grates, recommended for high capacities and good performance with coals from the Pittsburgh—Ohio Seam and other similar coals are described in six-page folder. Labeled diagrams and illustrations show how the hydraulic drive and steam drive units operate and how to install. Riley Stoker Corp.

229—Suspended Solids

"Colloidair Systems for Recovery of Suspended Materials. . ." technical bulletin GB2; describes a system for recovering suspended solids from process liquids, and for waste water treatment. Factual data is given on efficiency of the process, typical installations, operating principles, and analysis of types of industries that system can profit. Bulkley Dunton Processes, Inc.

230—Screening Equipment

Screening equipment for efficient removal of solids from water, sewage, and industrial waste is described in 28-page bulletin 2587. It gives complete data for both coarse and fine screens, and tables to determine the proper size unit for handling various capacities. Link-Belt Co.

231—Stationary Diesels

Savings that may accrue from use of straight run or cracked residual fuels with the Type TS-29 stationary and marine diesel engine are pointed out in 11-page bulletin 235. These engines, operating as Duafuel units also operate on gas. The booklet shows the engines installed in municipal central power stations, public utilities, and in industrial plants in sizes from 4800 to 10,000 hp. Nordberg Mfg. Co.

TO REQUEST FREE BULLETINS
Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

232—Piping Insulation

Low-temperature piping insulation known as Vapo-Wall, made of Dow Styrofoam, can do a better insulating job for less cost than conventional insulation according to this four-page pamphlet. Specification sheets and ordering data for standard and special applications are included. MMM Inc.

233—Gaskets

"Rubber and Gasket Engineering Handbook," 82-pages, is a comprehensive technical discussion of every phase of the subject including standards, specifications, testing, and special uses. Minnesota Rubber and Gasket Co.

234—Suction Pumps

Centrifugal Pumps — Four-page bulletin 512-A gives complete information on the Type SB horizontally split case, double balanced suction pumps including dimensional drawings and a cross section explaining construction. Graphs show performance of the 1750 rpm, the 1150 rpm, and the 3450 rpm unit. The Weinman Pump Manufacturing Co.

Pipes, Ducts, and Fittings

"Simplified Practice Recommendation R207-54, Pipes, Ducts, and Fittings for Warm-Air Heating and Air Conditioning," consists of a simplified list of pipes, ducts, and fittings as well as sketches intended as an aid to identification of the items listed. **Please send requests directly to Superintendent of Documents, Government Printing Office, Washington 25, D.C.: Price 10c.**

235—Insulation

"For More Reasons Than One . . . They All Picked Foamglas," seven-page bulletin FG 101 shows how, in 100 different buildings, Foamglas was used to insulate buildings, tanks and equipment, piping, or cold storage spaces. Physical properties are listed in tabular form along with an explanation of how the material is made. With the photographs are cross-sectional drawings of the way in which the material was applied in that particular job. Pittsburgh Corning Corp.

236—Packaged Steam Generators

Before specifying boilers for installing in existing buildings, you will want to read over the check list of what to look for in a boiler for this application as presented in four-page folder 512. Installation photographs show the fully automatic packaged steam generators offered by this company. Johnston Brothers, Inc.

(Continued on Page 106)

Pick INSTANTANEOUS HOT WATER HEATERS
ENGINEERED FOR SERVICE

Industries everywhere are replacing outmoded water heaters with Pick Instantaneous Water Heaters. Here are the reasons:

★ Water Is Heated Instantly. Entirely automatic, Pick Heaters operate by steam injection to heat the water in a flash to exact temperature desired and in volume required.

★ Fuel Savings Are Substantial. Steam injection heating is the most efficient method known. There's no waste because water is heated only as used . . . never stored and allowed to cool.

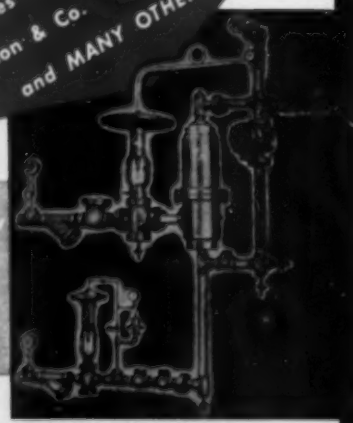
★ No Storage Tanks Required. Compact design of Pick Heaters permits out-of-the-way installation in corners, on walls or overhead. Saves valuable floor space.

★ Exact Temperature Control. Pick heaters can be operated at low or high loads with minimum temperature fluctuation. And it's done quietly.

★ Maintenance Cost Is Low. Pick Heaters can be cleaned in a matter of minutes — worn parts easily replaced.

★ Installation Is Inexpensive. Only ordinary pipe connections are required.

PICK HOT WATER HEATERS . . . Used by
• United States Steel Co.
• Ford Motor Co.
• H. J. Heinz
• Bethlehem Steel Corp.
• Hercules Powder
• Wilson & Co.
and MANY OTHERS



SAVES MONEY FOR ANY INDUSTRY THAT USES HOT WATER!

Write for booklet on how PICK HEATERS cut costs of Hot Water — No Obligation. Write IP 155

PICK MANUFACTURING CO. • WEST BEND, WIS.

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is there a "STOCK" answer to your "SPECIAL" gauge problems?

There may very well be, because USG manufactures and stocks more than 200,000 standard gauges and a complete line of gauge components to meet practically every pressure sensing and indicating requirement.

For over 50 years USG gauges have won acceptance for their high accuracy and dependability—more original equipment manufacturers specify USG than any other make...a tribute to their acceptance by industry.

Your USG Distributor has on his shelves, or can get for you fast, any quantity of gauges you want for any application. See your USG Distributor or call the factory for all your gauge requirements.

UNITED STATES GAUGE **USG** *Gauge Headquarters* for over 50 years

United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Penna.

MANY USG STOCK GAUGES ARE "SPECIALS" WITH OTHER MAKERS

For more than 50 years USG has been designing and producing many "special" gauges for industrial applications. Through the years many of these "specials" gained wide acceptance and have become standard in the industry . . . and stock items at USG.

Many of these more than 200,000 finished stock gauges in USG's stock room would be expensive "special" production items with other instrument manufacturers. In addition to this tremendous finished stock USG also maintains an inventory of component parts which can be readily assembled into a wide variety of "special" gauges . . . *practically at stock costs.*

Users of these USG gauges are assured of highest quality in every price class through USG's rigid quality control system. This constant testing of component materials is just one of the many reasons why USG gauges are world-renowned for their unfailing accuracy and dependability.

USG also maintains a Research Laboratory where extensive research is carried on to continuously verify the behavior of gauges under the most rigorous operational and environmental conditions. Annually, these tests save USG customers hundreds of thousands of dollars by eliminating the need for frequent gauge replacements.

This illustration shows a run of USG gauges being subjected to a pressure cycling test which simulates exaggerated service conditions. The unique "whip" test relieves the tube of stresses and strains and assures long service life and unchanging accuracy.

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NEW PATENTS

of Interest to Industry

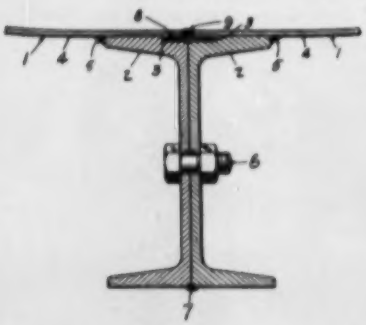
BY Melvin Hoel
PATENT ATTORNEY

Noncorrosive Welded Tank Joint

STORAGE TANKS that are to contain corrosive materials are generally constructed of, or lined with, a corrosion-resistant alloy metal. Such an alloy is more expensive than steel, so it is usually used as a thin sheet on the inner surface of the tank with a steel reinforcing member (such as a channel attached to the alloy sheet) to provide the required strength. Ordinarily, the alloy plates of a sectional storage tank are joined together by means of an alloy belt strap that overlaps the aligned edges of the adjoining plates and is welded with alloy material to the inner surface of the plates. Up to now, the adjoining edges of the plates have not generally been welded directly together because the carbon steel of the reinforcing member would tend to diffuse into the alloy weld and render the welded area subject to corrosion.

In U. S. 2,684,170, issued July 20, 1954 to Ewald Schmitz and assigned to A. O. Smith Corp. (Milwaukee, Wis.), the adjoining edges of the alloy plate are welded directly together by providing for an alloy chill between the edges of the plates and the reinforcing member. The belt strap is dispensed with, saving money for metal and welding.

The edges of the panels 1 of the tank are reinforced by a vertical

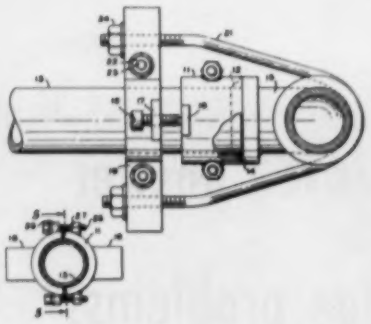


channel 2, which is welded to the alloy plate 4 by the outer weld 5. The welds 5 need not be of corrosion resistant material, as these welds do not come in contact with the contained material.

An alloy chill 8 is inserted into a recess 3 in the heel of the channels. The chills are preferably thin strips of corrosion-resistant alloy of a sufficient width to overlap the joint between two adjoining plates. They serve to prevent carbon steel dilution of the weld 9 joining the plates. The weld 9 is preferably a fusion weld produced by the position of molten metal at the abutting edges. The deposited metal should be of substantially the same composition as the alloy plates, and so should the alloy chill.

External Packing Device for Pipe Fittings

LEAKS OFTEN DEVELOP in threaded connections resulting in a premature shutdown of the plant or part of the plant to tighten



the connection or to replace a worn out pipe. Such occurrences are especially encountered in steam and water lines and in lines conducting corrosive materials. These failures occur most frequently at a turn in the pipe such as at an ell connection.

In U. S. 2,689,142, issued Sept. 14, 1954 to James R. Glazer, and assigned to Phillips Petroleum Co., such a leak is controlled by applying a packing clamp.

The packing clamp 11, having a beveled packing gasket recess 12, fits slidably on pipe 13 and compresses the packing gasket 14 against the pipe 13 and the leaking elbow 15. Pressure is applied to the packing clamp by tightening set screws 16. Anchor clamp 19 fits firmly on pipe 13 as a result of tightening nuts 22 on the bolts 23. The halves of clamp 11 are secured together by bolt 25 through welded washer 26 and the welded nut 27, (see illustration).

The device of the invention has been successfully employed to control leaks in threaded connections on steam pipe lines holding from 100 to 400 psi steam pressure, and on high-pressure oil pipe lines.

This device is primarily intended for emergency and temporary use, such as to control a leak until such time as the pipe having bad threads can be replaced. However, some installations have been left in service for extended periods of time.

In some cases it has been found, upon removing the device to replace the worn pipe, that the pipe threads were completely worn through so that the pipe and fitting were separated. The feature of the anchor bolt securing the pipe clamp to the fitting thus prevents a blow-out.

Another Stud Extractor

IN PATENT U. S. 2,686,447, issued Aug. 17, 1954 to Vernon L. Vock and Charles R. Ebert (San Bernardino, Calif.), a structure is described which is used for the extraction of the ends of stud bolts.

The conventional types of stud extractors have one or more inherent disadvantages. Some types cause an outward pressure to be exerted against the wall of the aperture. This pressure is developed either in the process of driving the extractor into position or when torque is applied to the extractor in an attempt to remove or back out the broken or frozen stud. This pressure may develop at both operations. Pressure thus developed is transmitted through the body of the stud to the stud threads and causes them to bond even more tightly in the mating threads.

All tapered shank extractors have the inherent disadvantage of having a relatively short area of engagement between the gripping members of the extractor and the straight-sided aperture in the stud.

A further difficulty with present chisel type extractors is that if the operator does not use extreme care and skill in inserting the extractor in the stud aperture, the tool will gouge or cut through the wall of the broken stud.

The method used in the present

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invention is intended to overcome these disadvantages. The extractor structure consists of a guide unit 10 and an extractor unit 11. The guide unit is shown in cross-section and bottom plan view. The extractor unit is shown in side elevation and bottom plan view in use.

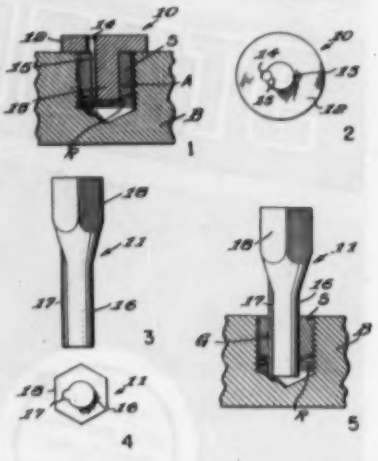
The guide unit includes a circular head 12 and a cylindrical portion 13 projecting axially from the lower face of the head. The head is provided with a small diameter guide hole 14 and the cylindrical portion with a semi-cylindrical groove 15 which is concentric with the inner half of the wall of hole 14.

The guide unit 10 is positioned with the cylindrical portion 13 in the pre-drilled aperture A in the stud bolt S and with the head portion 12 seated on the top face of block B.

A suitable bit is then introduced into hole 14 and the stud S is drilled with a resulting semi-circular groove. The guide unit 10 is then removed and the extractor unit 11 is introduced into the aperture.

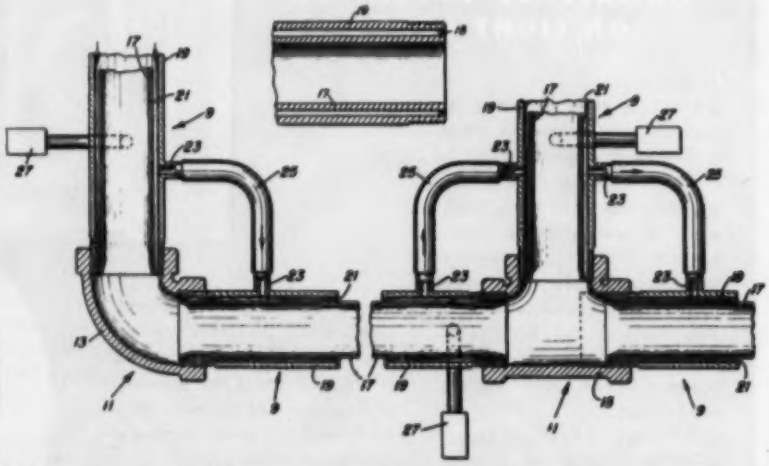
The extractor unit includes a cylindrical shank 16, whose diameter is equal to that of the cylindrical portion 13 and which is provided with a rib 17 which conforms to the groove G, and as well as to socket 18.

With the extractor unit positioned a wrench is applied to the socket 18 and the extractor unit rotated, with a resulting withdrawal of the broken stud S.



A positive hold is obtained between the extractor unit and the stud bolt, whereby the latter is rotated without damaging pressure on the female threads of the block recess R.

Heated Piping System



A HEATED PIPE SYSTEM is described in U. S. 2,683,592, issued July 13, 1954 to George A. Birney (Le Roy, N. Y.) which does not require special heated fittings, but which can be used with standard, non-jacketed pipe fittings.

The pipe section 9 consists of an inner pipe 17 and an outer pipe 19 of the same length and connected together at the ends by welding a flaring portion of inner pipe to the outer pipe or by welding a ring 18 between the ends of the pipes (see insert). Thus a jacket 21 is formed between pipes 17 and 19.

The outer pipe is provided with nipples 23 which are connected to a steam supply by means of connecting piping 25, which also connect the jackets of the adjacent sections of pipe together. They can each be connected to a source of additional steam, if desired. The outer pipe 19 also has a condensate trap 27.

Pipe fittings are sufficiently heated by contact with the ends of the heating jackets.

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Out Our Window

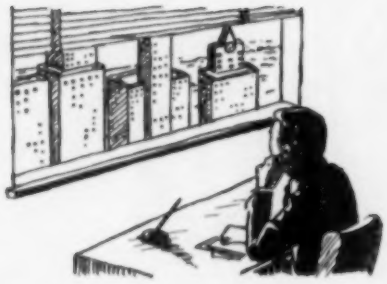
THE OLD TWO-FACED boy on the cover of this issue of INDUSTRY AND POWER is Janus, the Roman god. He has two faces because he is the god of doorways and gates, of going out and coming in — a job in which it is most essential to be able to see in both directions. The first month of the year was named after him, quite logically, for that is the time when we take a few minutes off to look back and see what we have accomplished, and to look forward to see what we can expect. Janus is, then, the god in charge of Review and Forecast. As such, he appropriately graces our cover this month — for this is I&P's Annual Review and Forecast Issue.

Throughout the year the Editors have added material to a large file labeled "Rev. & Fore.", in which there are twenty-five large envelopes, one for each of the major topics covered by INDUSTRY AND POWER: Air Conditioning, Steam Generation, Electrical Distribution, Water Treatment . . . Gradually, this file was filled, and early in November, the Editors started taking it apart, analyzing the data, weighing the importance of each item.

Then it was time to start making contacts. November and December were heavy travel months for the Editors. They were busy carrying their preliminary articles from one authority to another, adding comments, rearranging emphasis, rewriting a line or a paragraph. Finally, toward the end of December, the job was done, and the magazine went to the printer..

This year the Review and Forecast Issue has been divided into two parts. The first, starting on page 51 offers a concise summary of developments in the fields in which our readers are most interested. These reviews must be general, for a whole volume could be written on each of the subjects selected and still not completely cover application advances of just the past year. Also, we have combined with these capsule reviews, short forecasts of what can be expected in the months ahead.

These short articles are worth the study of every engineer whose job it is to keep his plant running. It is, indeed, a well informed engineer who will not find at least one new idea, one guide for the year ahead in each of the articles; for these articles are the combined comment and opinion of the country's experts in each field.



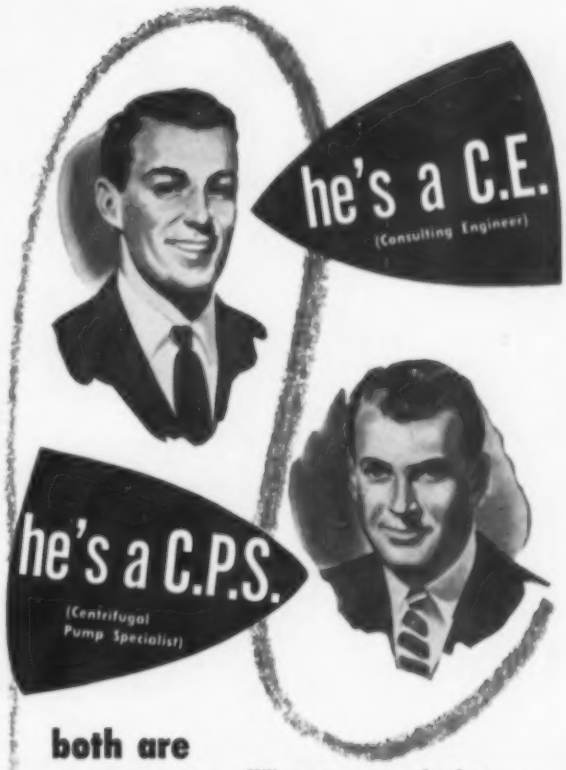
To get the most value out of this type of feature, the reader must have not only the general comment, he must have the specific example. We asked the major suppliers of industrial equipment to tell us which one item, put on the market by them during the year, they considered most important to the readers of INDUSTRY AND POWER. We have gathered the new products they submitted into one section, "'New Products of 1954," and offer them as specific examples of developments in industrial equipment during the year. This is the second part of this Review and Forecast Issue.

By making use of both sections, the reader first can get a general picture of the past year plus a look at the year ahead, and second, a chance to examine the specific products the manufacturers offer as evidence of industrial progress.

To some it may seem that there are not very many developments worth mentioning in one year in any one field. The research scientist or the development engineer could read the section on his particular specialty and say, "Why, there's nothing new here. I knew about that more than a year ago." And he would be right. Developments in engineering do not go from the laboratory to the plant in one quick jump. Cermets, for example, the materials made by joining ceramics to metal, were well known in the jet aircraft industry many months ago and are now giving way to newer alloys just coming from the metallurgical laboratories. Yet, general applications for cermets are just beginning to show up.

INDUSTRY AND POWER deals with practical plant applications for equipment — commercially available materials, and methods that can be put to use today. For that reason, the research man will not find in this issue anything startlingly new, weird, or wonderful. But the practical engineer in the plant, the man who must select, operate, and maintain the basic equipment that keeps his plant running, will find here enough new ideas to keep him busy for many months if his plant is to keep up with his competitors, turning out more and better products at lower cost.

It is time now to look in both directions. Like Janus, you must look back to see what has been accomplished . . . ahead to see where you are going.



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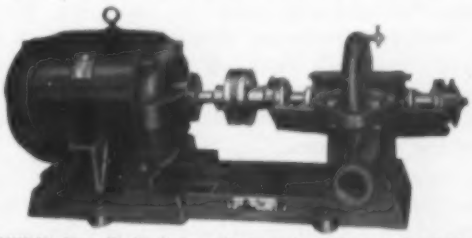

WEINMAN Type 38 2" Pump with tapped openings. Dependable and quiet-operating. Ideal for water circulation in air conditioning or radiant heating installations and many industrial uses. Retains all the desirable features of a split case design yet is available at a moderate price. Write for Bulletin 519-A.

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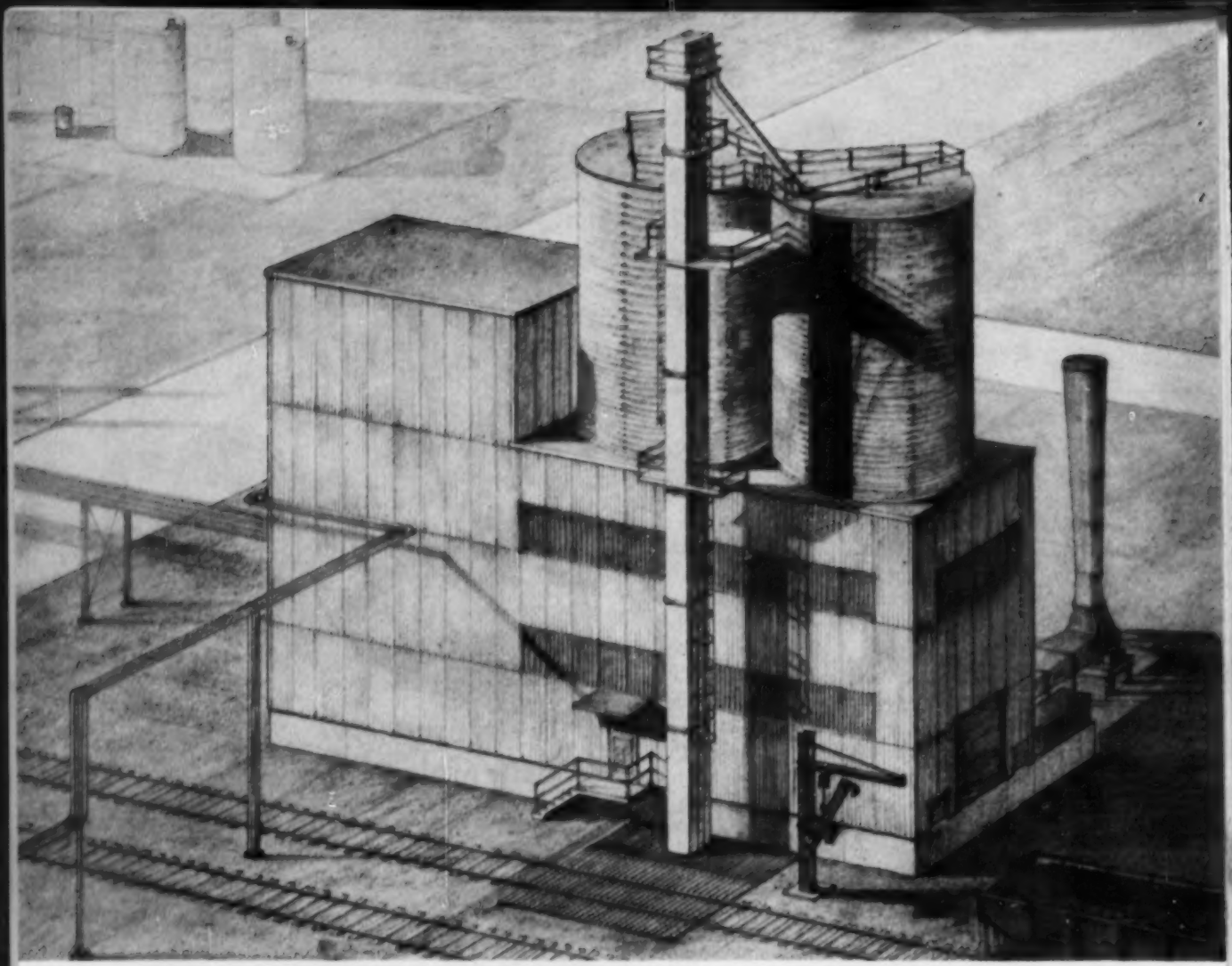

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The results? Fuel and labor costs are at a minimum. Dust concentration is well within the limit fixed by the Louisville Air Pollution Control Commission. Initial cost of the plant was $6.38 per pound of steam per hour, compared to an average $8 to $10 for plants the same size. And total cost of steam—including fuel, labor, maintenance, power, and fixed costs—is only 60c per 1000 pounds!

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If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars each year.

facts you should know about coal

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For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

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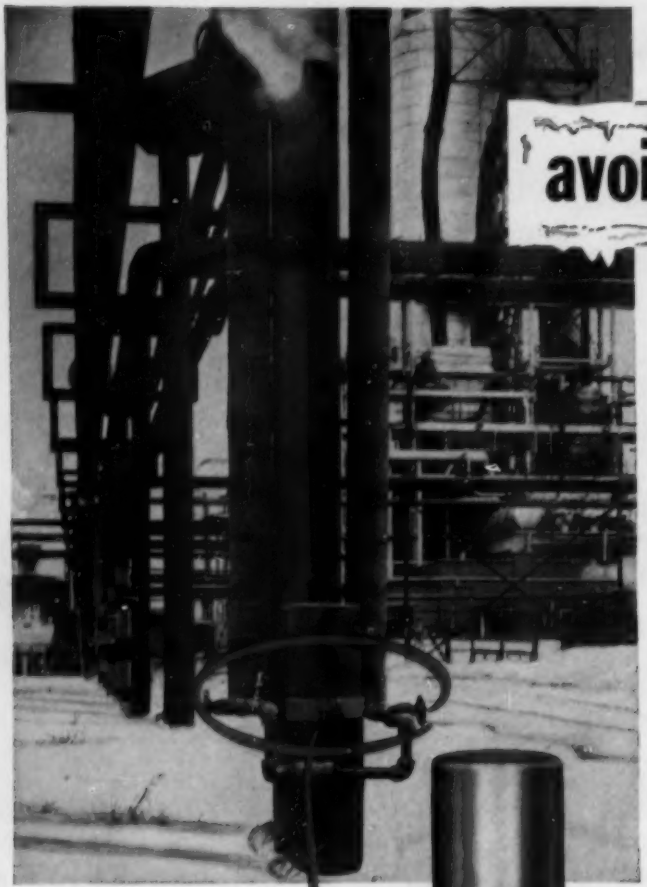

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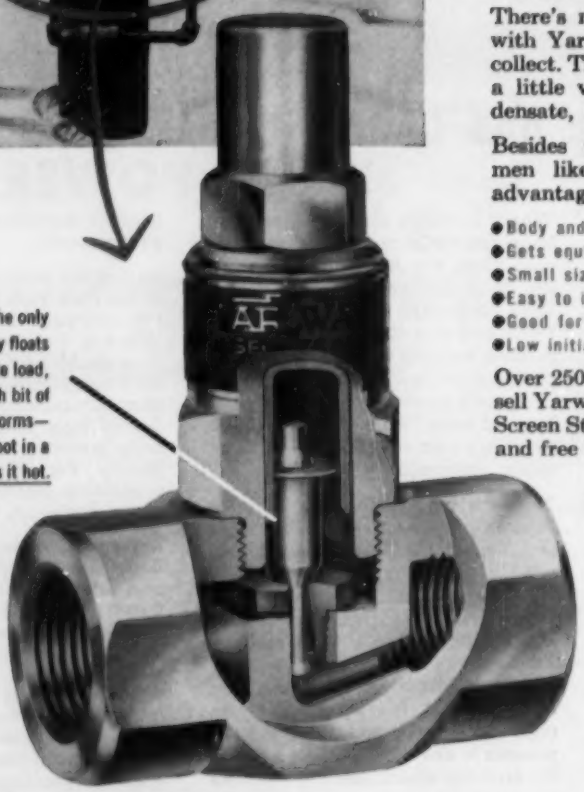

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Industry and Power

Annual Review and Forecast

This collection of 19 staff-written reports is aimed straight at you who sustain the environment for production. You will find in them all of the technical developments of the past year that are most significant for the engineer who keeps the plant going. The reports also point the way from which will come the technical developments that will affect your work in the future. You will read these pages carefully. You will quote them often — to those whom you serve and to those who serve you. You will keep them for a long time to come. (Single copies of reprints are available gratis.) Our satisfaction for the work these reports represent will come from their value to you.

ANNUAL REVIEW AND FORECAST

Steam Generators

Big in Utilities . . . Packaged for Industry

TWO MAJOR FACTORS have influenced the operations of boiler manufacturers during the past year. One is the continuing utility trend toward higher pressures and higher temperatures in the conventional, subcritical power cycle plus the decisions to advance well beyond the critical pressure. The other is an accelerated industry demand for packaged type boilers.

During 1954, Foster Wheeler received a contract from the Detroit Edison Company for the largest capacity single steam generating unit of record. This unit will have a capacity of 2,000,000 lb per hr at 2450 psig-1050 F with reheat to 1000 F. It will be arranged for firing bituminous coal as the principal fuel and oil as an alternate fuel, will include provisions for burning small quantities of blast furnace gas, and will be designed for natural circulation.

In terms of engineering design, the 5500 psig - 1150 F Babcock & Wilcox boiler for the American Gas & Electric Company's Philo power plant and the 6000 psig - 1200 F Combustion Engineering unit for the Philadelphia Electric Company have attracted great interest. These units will not have any drums. Water will flow through a continuous circuit, changing from water to superheated steam on the way, and the steam will be returned from the turbine twice for resuperheating. The resultant gains will give net thermal efficiencies of over 40 percent.

Present knowledge indicates the furnace design and fuel firing arrangement of supercritical pressure units will be essentially the same as those used in current practices. However, since the heat absorbed by the superheater and the two reheaters will be much greater than their lower pressure counterparts, and since the heating of water to the vapor stage will be so much less, radiant superheat and reheat surfaces become necessary. Their position in the steam generator probably will be in the upper furnace where the available heat level is lower.

Utility Plant Economics

Economics is the key to the decisions to go to supercritical pressures. As recently as 1951, the average efficiency in the entire U. S. was 25 percent. The very best plants today provide an over-all thermal efficiency of about 37 percent. While the industry average now is down to one pound of coal per kwh and modern central stations are down to about three-quarters of a pound, with the new supercritical pressure units rates will be only 2/3 pounds of coal per kwh.

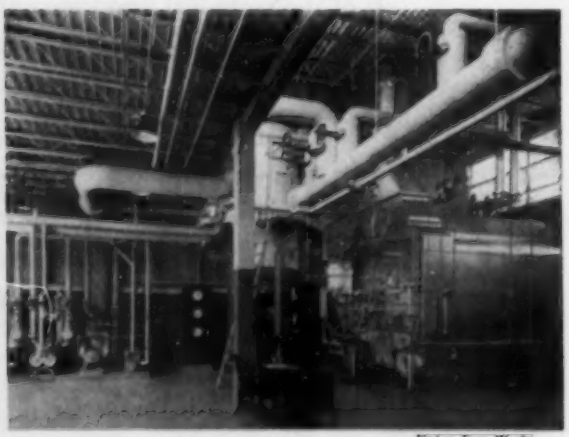
Thermal gains are extremely important because of their effect on fuel consumption. Currently 50 percent of the output of all electric utility systems is generated with coal. This requires over 22 percent of the total coal industry production. In one year the cost of fuel for a big boiler may equal the cost of the boiler itself. With vast increases in generating capability anticipated, even if fifty percent of all the electric power generation were accomplished by atomic power by the year 2000 (as some authorities think may occur), the coal industry would still have to produce six to eight times more coal for the electric utilities alone than it does at present. This is about twice as much coal as the total mined today for all purposes.

These conditions strongly influence design practices. In the pressure ranges below 3200 psig, boiler and turbine manufacturers are concentrating additional emphasis on the time required to place a boiler in service or to remove it from the line. With large power blocks built into single units the fixed charges for these periods are large enough for economic evaluation. Arrangements for isolating sections of the boiler or its associated auxiliaries are being carefully studied as an aid to reducing outage time or for permitting partial operation while doing maintenance on components.

Certain very significant operating advances have been recorded in the burning of lignite. High moisture lignites have been successfully pulverized in bowl mill pulverizers and fired through standard burners. No interruption in service, nor change

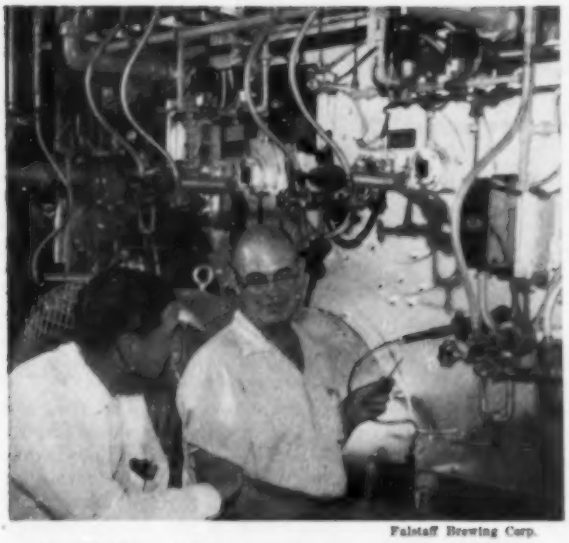
Cyclotherm Division

Typical installation of self-contained fire tube boilers.



Union Iron Works

Typical installation of a packaged water tube boiler.



Falstaff Brewing Corp.

Typical flame failure safeguards on industrial boiler.

The Hays Corp.

Interior of utility control panel during fabrication.

in equipment rating occurred on one 1350 psig-775 F Midwestern utility steam generator burning a pulverized Western Kentucky coal when a switch was made to a 35 percent moisture, pulverized lignite of 42 Hardgrove grindability.

Spreader stoker developments have considerably eased the almost universal concern with the effective disposal of industrial by-products, and have contributed materially to the efficient firing of solid fuels. With their combination suspension and burning on a grate design characteristics, spreader stokers are able to handle both low grade mineral fuels and various by-products, such as wood, bark, sugar bagasse and high and low moisture refuse fuels, with very satisfactory results. Chemical recovery boilers in the pulp and paper industry are another illustration of economic utilization of wastes. These units are increasing in capacity, one of 750 tons per hour rating being announced recently.

Industrial Activity

In the industrial field there is a marked continuance, and in fact an acceleration, of the trend to the packaged boiler. Available in both fire tube and water tube designs, these units can satisfy almost any operating demand. Single unit capacities are increasing, and in some instances physical dimensions are decreasing despite proportionately higher ratings. Many designs are completely shop assembled, factory insulated, fire tested and shipped as one unit with all major auxiliaries mounted on the boiler. Others include separate shipments of packaged component equipment designed especially for use with the particular boiler and suitable for ready installation on the job.

Buying Trends

With the trend to packaged units, some manufacturers report a definite change in buying habits. While price competition is keen, consumers seem to be better informed, and although demanding more value for their dollar, they will pay price differentials to obtain the features they want. Many demand approval by Underwriters Laboratories and Factory Mutual sanction of components and insist upon boiler-burner assembly and performance testing prior to shipment. Some buyers even are requesting the manufacturers to standardize on ratings, phraseology, and engineering designations as an aid to more intelligent selection.

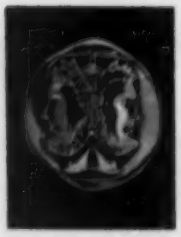
Many customers recognize the advantage of multiple fuel selection, and they want control systems adequate for fast changeover. They place great reliance on the control equipment and flame failure devices, and do not have any hesitancy in putting complex equipment in their plants. Rather, they feel automatic equipment will pay marked dividends in the reduction of operating labor. The manufacturers are doing everything possible to satisfy demands; for example, mechanical draft equipment is available with presealed, air cooled bearings, eliminating the need for lubrication and water cooling lines.

Service also is a major consideration in the buyer's thinking. He wants more and more items normally considered beyond the standard boiler auxiliaries included with his boiler. Some engineers request feedwater pumps, heaters, and treatment systems (all available in packaged form) included as part of the auxiliaries. This even applies to installations above the normal packaged boiler ratings—to plants purchasing field erected units in capacities of 100,000 lb per hr or more.

While the packaged units have up to the present time been considered primarily confined to liquid and gaseous fuels, coal cannot be discounted. In many areas coal can provide the cheapest Btu value per dollar expenditure of any fuel. The manufacturers recognize this condition and some have developed automatic coal handling and feeding systems to apply to the small industrial water tube and HRT designs. Units are being shipped complete with underfeed stoker assemblies, including the furnace, bridgewall, fan, and controls—even with an auxiliary oil burner above the stoker if desired. Only the drive unit and service connections are added in the field.

Summary

In the future, steam generating unit design will be based more and more on concepts of heat transfer instead of reserve capacity. Pressure firing will be prominent, and greater reliance will be placed on the new automatic controls in a constant effort to reduce operating labor. Purchasers are already demanding larger capacity units and installing them in multiples where their system demands exceed currently available single unit sizes.



ANNUAL REVIEW AND FORECAST

Pumps

Stress Is on Leakproof Designs and Seals

THE PROBLEMS confronting pump designers are among the most complex in industry. Service conditions in transferring liquids include numerous factors, such as pressure, temperature, flow characteristics, and nature of the fluid being pumped. With the changes in steam plant design, the effects on pressure and temperature are obvious, while the continuous development of diverse process operations has introduced an enormous number of combinations, each of which imposes individual design problems.

Service Requirements

Depending upon the industry, the liquids being handled may be corrosive; extremely viscous; flammable, poisonous, toxic, or otherwise hazardous; or extremely hot as in the case of molten metals and other process liquids. Frequently, the fluid may contain abrasive solids in suspenion, or it may have characteristics that introduce problems of product degradation. If the system is closely controlled and metered, the necessity for preventing pulsation may be absolutely imperative.

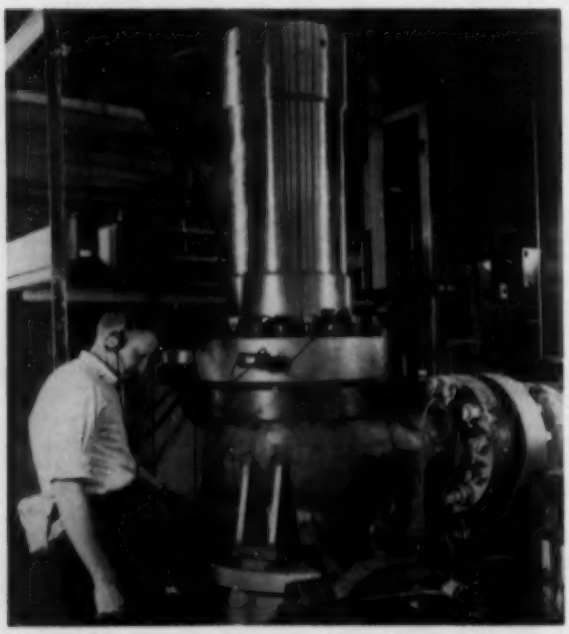
Maintenance Problems

Despite these factors, hydraulic considerations and construction materials are only part of the designer's problem. The principal headache is maintenance. This is readily understood when consideration is given to the fact that most fluids are handled by centrifugal type pumps, often operating at extremely high speeds. Some estimates indicate that in chemical process industries alone annual pump maintenance approaches 70 percent of the initial investment. Packing materials, labor for their replacement, and the value of liquid lost through leakage all are costly. Nuclear processes are especially critical because leakage of radioactive liquids, which are highly destructive to sealing materials, cannot be tolerated.

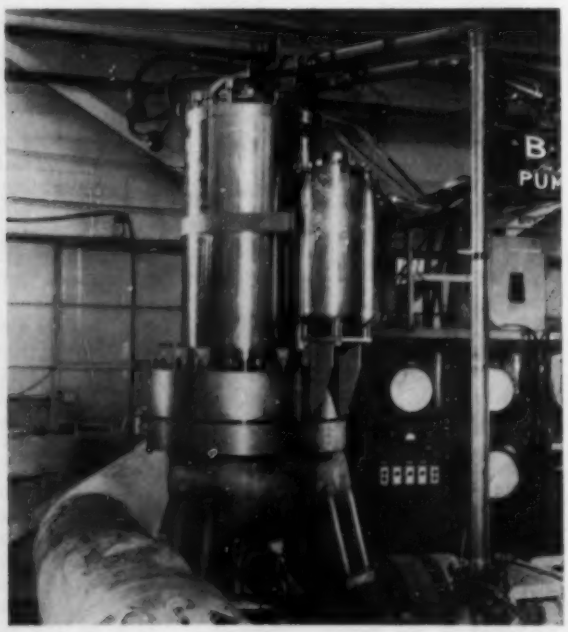
Design Trends

Among the pump manufacturers the most prominent approaches to the various problems have been the investigation of designs eliminating the need for sealing devices and the improvement of seal constructions, combined with greater use of new materials. Of course, packingless diaphragm pumps — mechanically, pneumatically, or hydraulically actuated — have been the subject of study for many years. But they are restricted in what they can accomplish because of their limited discharge pressures and the fact that the diaphragm is exposed to the fluid.

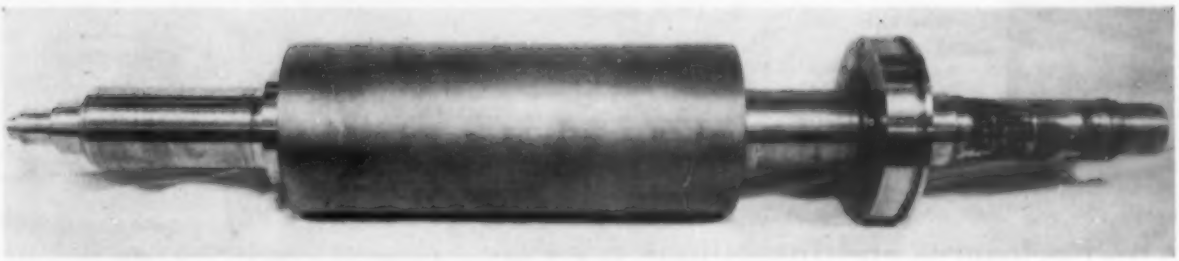
As a result of the atomic energy program, electromagnetic pumps in two general classifications — the conduction (Faraday) type and the induction type—are receiving marked attention. The active part of conduction units is a fluid line or duct passing at right angles through a constant magnetic field. Bus bars are welded or otherwise attached to opposite sides of the duct so current can be forced through the fluid along an axis mutually perpendicular to both the magnetic field and the direction of flow. The principle is the same as that involved in the operation of an electric motor. With the pump, the developed force motivates



Westinghouse canned motor-pump in test loop operation.



Byron-Jackson canned motor-pump in test loop operation.



This photograph shows the construction details of the canned rotor assembly for an Allis-Chalmers motor-pump unit.

an electrically conductive fluid instead of rotating a shaft.

Induction type electromagnetic pumps, which are analogous to induction type motors, differ from the conduction type in that a moving magnetic field replaces the stationary magnetic field. This moving field induces currents in conductive liquids and the accompanying forces tend to make the fluid follow the moving field. The two general designs of induction units are the linear flow type and the helical flow type. All electromagnetic pumps have no internal moving parts and require no seals, making them particularly attractive for handling radioactive materials and liquid metals which burn or explode on contact with the atmosphere.

Canned Motor-Pumps

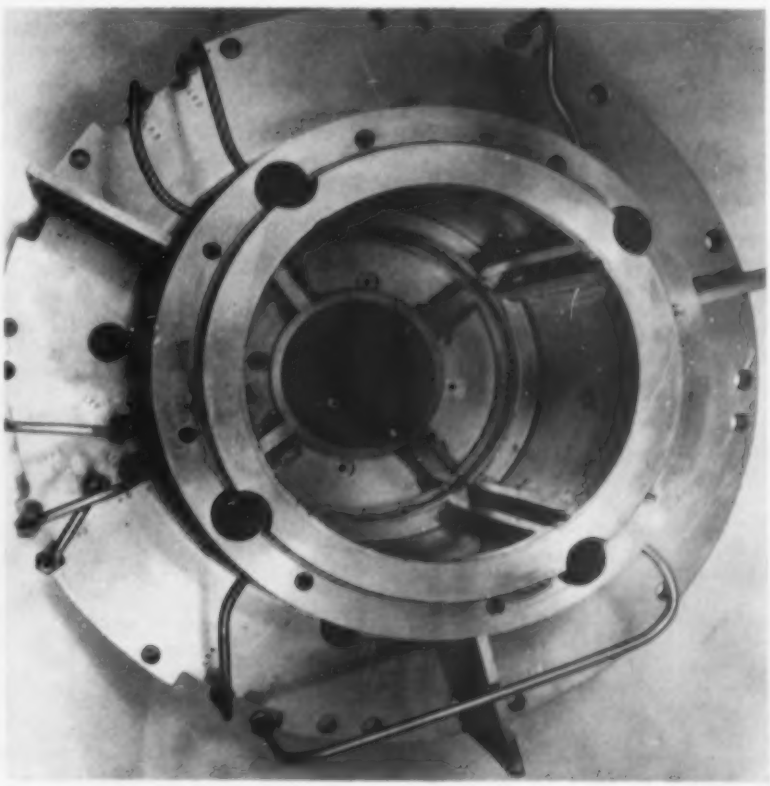
However, since electromagnetic pumps are limited to certain applications and suffer in efficiency, size, and weight when compared with standard centrifugals, among current designs the most promising leakproof arrangement for diverse services appears to be the combined motor-pump unit. This type has the impeller mounted on the shaft of a conventional motor rotor, and the rotor and bearings are entirely submerged in the pumped liquid. Both the rotor and the stator are sealed from the fluid in nonmagnetic metallic enclosures, and because of this construction they are aptly termed "canned" pumps.

Principal problems in the development of canned pumps have been the sealing enclosures, cooling arrangements, and bearings. Most applications now include provisions for circulating part of the pumped fluid from the high pressure side of the pump to the rear of the rotor chamber to provide cooling. Graphite appears to be the most prominent bearing material, but various metals, ceramics, plastics, carbides, and other materials have been applied.

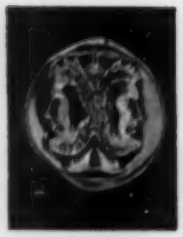
Standard constructions using sealing devices also are undergoing continuous development and improvement. In centrifugal pumps, auxiliary vanes that prevent leakage while the pump is running have been added to the impellers. A stationary seal prevents fluid escape when the pump is down. Manometric type liquid or mercury seals also are being used, and various types of mechanical seals have been developed. These include the standard single seal, balanced single seal, cooled seal, lubricated seal, and double seal with auxiliary flushing liquid.

Trends to automatic operation have increased the use of positive displacement, reciprocating type pumps for such services as chemical injection, proportioning, and pressure lubrication in addition to fluid transfer. Such units will eject additives into lines or vessels carrying almost any service pressure and can be applied to almost any quality of product with the currently available construction materials.

In the future efforts will be intensified toward further development of leakproof designs. Centrifugals will undoubtedly operate at higher speeds and be constructed for higher pressures and temperatures. More units will have such features as molded synthetic rubber casings or graphite bearings and impellers.



Lower pressurized bearing for an Allis-Chalmers canned motor-pump assembly.



ANNUAL REVIEW AND FORECAST

Electric Motors

Enclosures and Insulations Set Pace

ELECTRIC MOTOR progress has been marked by continuing attention to enclosures and insulation materials. Preferences are increasing for "more-protected" standard electric motors.

The old-fashioned, open motor is now out of the picture altogether. The totally enclosed, fan-cooled is steadily gaining popularity. One manufacturer reports that 60 percent (by dollar volume) of his sales in integral hp motors below 150 hp are of the TEFC type. His big TEFC motors are selling at four times their comparable pre-war levels.

It is becoming commonplace in continuous process plants to run electric motors until they fail. Because the TEFC's can be expected to run the longest, they are popular for process applications. Such motors are known to have held up for seven years' continuous operation, and are still turning.

Brute-Force Cleanup

Maintenance is costly, and competent help is scarce. Brute-force cleaning methods using unskilled help is becoming widespread. Routine cleanup is coming to mean nothing more than an indiscriminate hosing down. The TEFC motor can take it. One large Eastern utility figures that it can afford TEFC's when costs for plant cleanup help go above 60c per hour.

Machine tool builders are using more TEFC motors in their equipment for several reasons. Extended motor life keeps the repair man away, and keeps the machine producing for its owner. The machine tool builder does not have to worry about putting a motor in a hard-to-service position if little service is anticipated. He can put a TEFC motor where natural ventilation is poor, knowing that the motor provides its own ventilation.

Outdoor motor installations are enjoying varying popularity, largely determined by climate. It is certainly cheaper to pay a bit more for a more complete enclosure than to build a shed around the motor. But it is quite difficult to service an outdoor motor, particularly in locations that often have snow or ice storms. Where weather is generally not severe, outdoor motors are more popular than where outages are likely to occur in severe or inclement weather conditions.

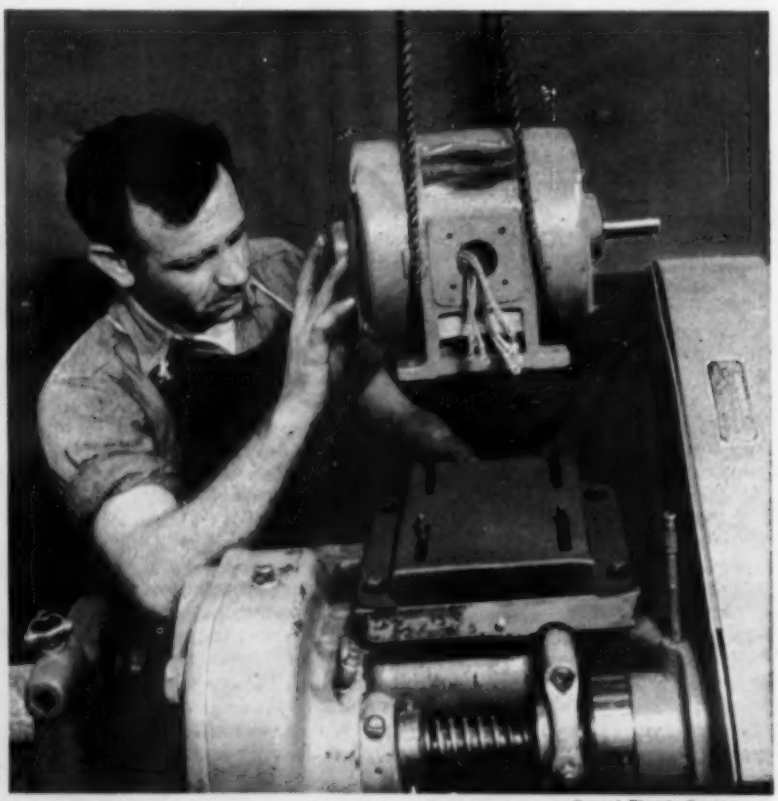
Insulation Standards

Inside the motor enclosure, insulation constitutes a great part of a motor's vulnerability. Perhaps most basic to the insulation problem is the program to revamp the standards by which insulations are evaluated and classified. It is being urged that present classification by composition be dropped in favor of classification by actual performance under life tests. It is hoped that revised editions of all the pertinent codes will be available in 1955.

Among the newest of the insulations announced is a class of insulations containing base materials that are insulators in themselves instead of being carriers only. Life expectancy of the new material is 50 percent greater than conventional insulations. Another revolutionary approach to motor insulation, and of stators in particular, calls for totally embedding the completed windings in insulating plastic or silicone rubber. The stator windings would present a smooth outer surface, free of crevices between conductors.

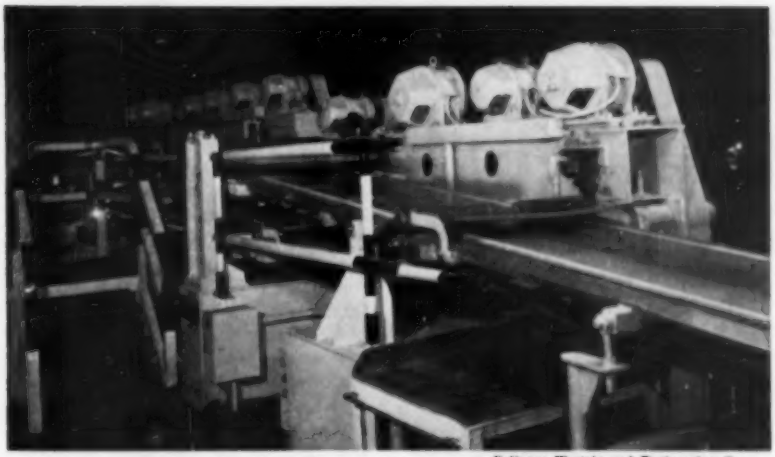
Rerating Program

New insulations, along with new metals and heat transfer methods, were a principal factor permitting the NEMA rerating program covering a-c motors from 1 to 30 horsepower. The first motors built to the new standards became available about a year ago. Most manufac-



General Electric Company

Replacement of old-standard motors with motors built to new NEMA standards is simplified by low-cost adapter plates, such as the one shown here.



Reliance Electric and Engineering Co.

Lineup of motors at U. S. Steel's Fairless Works drives 40-in. side trim and shear line. Such arrays of individual drives are getting more common.

turers are now producing all sizes up to 10 horsepower, 1800 rpm.

Acceptance of the new NEMA motors has proved rather measured and cautious during the first year. Original-equipment manufacturers have held off somewhat until a substantial range of sizes was available from several suppliers. Now, acceptance is progressing as rapidly as was first expected, with indications that interest in the new motors will soon accelerate rapidly. For the plant engineer about to buy a replacement motor, original fears about the high cost of adapting the new motors to old mountings have been dispelled. Adapters have been made available costing no more than $10 for the largest sizes involved. In some cases, adapters are made available at no extra cost.

It can be expected that all production will be limited to the new NEMA motors once the manufacturers are tooled up for their complete lines. Special orders for old-standard motors will always be taken, though these special orders will probably be limited to installations where precise electrical characteristics (rather than mechanical requirements) have to be matched by the replacement motor.

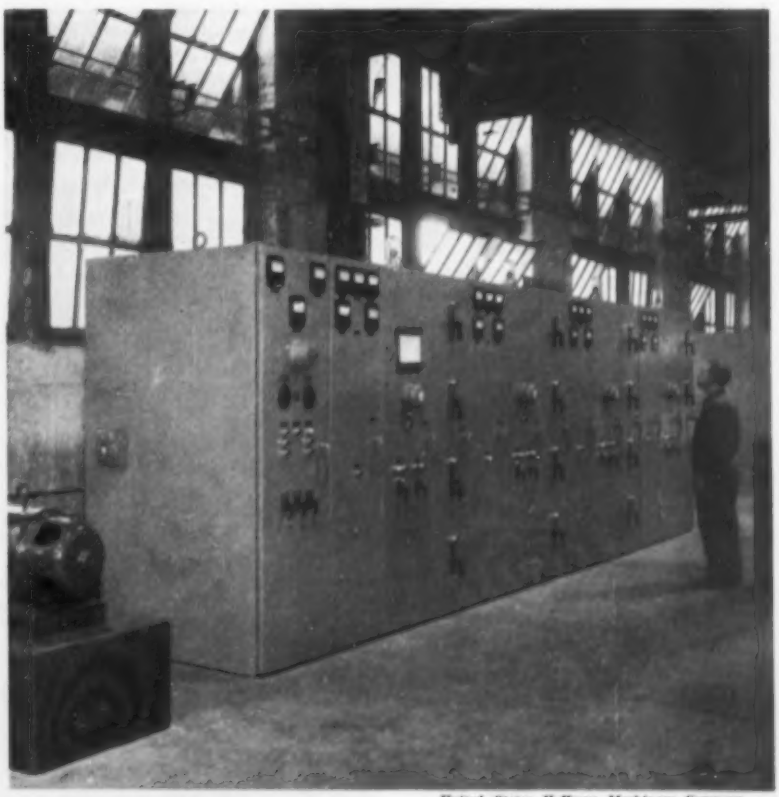
Drives More Important

Motor drives are becoming more and more important. Consequently, motor performance is being defined in more explicit terms related to acceleration, deceleration, shock, reversal time, and accuracy of positioning. More than ever before, motors are being called upon to do more than just turn a shaft.

Part of the trend in motor application is traceable to the current popularity of thinking in terms of "automation." Automation calls attention to the fact that minimum standards of reliability are tending to get tougher. Thus, "automation" thinking adds to the pressures behind wider adoption of TEFC enclosures for increased reliability where the failure of a single motor would impose down-time and product waste all along the line.

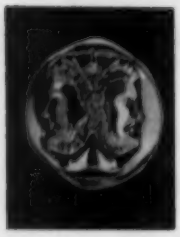
Motor controls are continuing to show a trend toward centralization. More power is being handled per cubic foot of control cabinet. Pneumatic, mechanical, and electronic packaged units, particularly for special drives, have gone a step beyond enclosure within a single cabinet. The electronic building blocks found within some packaged units are themselves being wrapped in distinct units. The electronic units are assembled, wired, sealed in plastic, and encased in a metal can. As many as 21 electronic subassemblies in sealed packages have been used to build a single drive control.

Considerable push is being put behind the use of three-coil overload protection for three-phase motors. It has been demonstrated that considerable damage can result from a fault that imposes excessive current in the unprotected phase. The present-day emphasis on reliability is putting greater value on three-coil protection. It costs little more, and often takes no extra room.



United States Hoffman Machinery Company

Exciters (far left) and control center feed four 1250-kw, 9600-cps motor-generator sets for induction heating of shells at Scranton Ordnance Plant.



ANNUAL REVIEW AND FORECAST

Piping, Valves, and Specialties

New Materials Speed Product Developments

HIGH PRESSURE — high temperature demands in steam plants and process industries have made a tremendous impact in the field of piping, valves and steam specialties. The most modern rotary forging tube mill for the production of heavy wall seamless tubing in the world is now under construction in this country and is expected to be producing during the first quarter of 1955. At the present time, seamless heavy wall tubing in commercial quantities is available only from Japan and Europe, but now the U. S. will have a domestic supply source for this important commodity. The range of sizes will be from 5½ to 16-in. outside diameter, up to 3-in. wall thicknesses, and lengths to 60 feet. Monthly capacity will be 8000 tons.

This installation is evidence of the rapidly increasing demand for high pressure — high temperature products. For a long time, heavy walled seamless piping has been made by the forging and boring process, and during the last three years a hollow forging process for the manufacture of heavy-walled piping also has gained considerable prominence. Automatic welding methods and advances in the welding of pipe joints, such as the development of consumable insert rings, also have contributed materially to the continuous efforts to meet the growing needs.

Product Materials

Additional indication of the necessity for finer products is indicated in the fact that the use of industrial chemicals has multiplied 166 times in the past 50 years. Naturally, the problems of handling the many diverse, and frequently corrosive, materials have increased proportionately. Polyvinyl chloride, Saran, tenite butyrate plastic, glass-lined, cement-asbestos, alloy steel, stainless steel, and innumerable other types of piping—as well as thin wall stainless steel tubing — all are available to meet the service requirements. In recent years, Type 347 austenitic stainless steel has been used extensively in power piping installations at service temperature exceeding 1050 F.

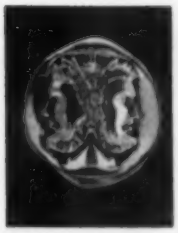
Manufacturers of valves, fittings, and specialties also are influenced by this trend. Traps, steam separators, pressure regulators, temperature controls, and other system components are being built in the new materials to complement the available types of resistant piping. Valves and complete lines of fittings including caps, couplings, plugs, unions, reducing bushings, 45 and 90-deg elbows, and tees are being molded of polyvinyl chloride; high pressure instrument valves as well as self operated controllers and steam specialties are being fabricated entirely of stainless steel; cast iron, boltless tapping sleeves are available for cement-asbestos pipe; and full encirclement saddles provide the necessary reinforcement at welded taps in high pressure pipelines.

Manufacturers report that the principal trend in addition to product developments using the newer materials lies in consumer demands for quick delivery and for lower prices. They report that the customers carry less stock — expect the manufacturer to maintain an adequate inventory. Furthermore, the buyer wants smaller physical size in the product for the same performance — without increasing the problem of maintenance. He also looks for simplified system components that will provide close control without costly over-instrumentation.

There seems to be a marked increase in the use of solenoid valves and remotely adjusted regulators for various service conditions. The development of specific types for particular service conditions, such as handling petroleum products, high steam pressures, and so forth, places great demands on the manufacturer. In the face of these conditions the manufacturer still must assure that each item performs its primary function, and usually with a greater degree of precision than previously accepted as standard.

Parke, Davis & Co.

Many process operations require high quality piping, valves, and specialties.



ANNUAL REVIEW AND FORECAST

Refractories and Insulation

Better Materials and Application Techniques

MANUFACTURERS of refractories and insulation are encountering consumer demands for thinner and lighter weight materials that will still provide improved performance at more severe service requirements. This condition is influenced primarily by the continuing trend to compact designs, particularly in the packaged boiler field where unnecessary thickness would affect the over-all physical dimensions. Yet the materials still must be durable to withstand breakage in transit and must resist corrosion and abrasion.

New, lightweight refractory tiles are available for boiler tube backing, and the aggregates in castable refractories show continuous improvement. Castables consist essentially of refractory aggregates mixed with suitable hydraulic binders to furnish cold setting characteristics similar to those of ordinary concrete. They can be used to form a monolithic construction in difficult locations, and will not disintegrate under repeated heating and cooling cycles. While service conditions fall roughly into two classifications—operation above or below the vitrification point of the castable materials—the number of aggregates with different physical properties permit extremely precise selection for specific applications.

Insulating materials also show marked development. Fiber glass, canvas covered or wrapped in asphalt saturated kraft, gives improved performance for low pressure steam, and both hot and cold water service with appreciably less thickness. Fibrocel pipe insulation is a new product, made from exploded silica, for services in the 35 to 300 F ranges. Standard, well-known and time-tested materials all exhibit increasing versatility. Magnesia is now available in water resistant form. Mineral fiber blankets, diatomaceous silica pipe covering, the numerous block insulations, and the mineral fiber insulating and finishing cements show the continuing research efforts to develop products that resist deterioration at the new higher heat requirements. Even aluminum paints, some with special heavy silicone content are available that resist temperatures to 1700 F.

Refractory & Insulation Corp.

Workmen spray applies castable cement to the ash hopper of a utility boiler.

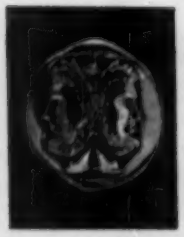
Application Techniques

Aside from the materials themselves, the most important trend in this particular field is the development of application techniques. New products are being marketed for applying castable refractories, all of them designed to cut installation time and cost. The possibilities are almost limitless because the consistency can be varied to permit pouring in place, precasting to special shapes, spraying with cement guns, or plastering with a trowel. Studies also continue on refractory anchors and fasteners—all intending to facilitate erection but still improve the ultimate construction.

Probably welding techniques have made the greatest change in the methods for applying insulation. Rapid spotting of studs, speed clips, insulation pins, and similar fasteners greatly reduces installation time and provides a greater guarantee of a permanent, uniform covering. If maintenance is required, the insulation can be readily removed and replaced without difficulty. Joint construction can be controlled, thus assuring an effective thermal barrier. Many projects also include aluminum, Asbestocite, or other suitable jacketing, and power tools aid the application of these materials.

Johns-Manville

Stud welding greatly facilitates the application of insulation and jacketing.



ANNUAL REVIEW AND FORECAST

Heating, Ventilating, and Air Conditioning

Comfort--- With Positive Quality Control

UNLIKE SOME of the other technical fields, the manufacturers of heating, ventilating, and air conditioning equipment are as much—if not more—concerned with the comfort of people as they are with the economical operation of the plant. And many of the developments in 1954, and future developments in 1955, will reflect the growing demand for better, more comfortable working conditions by the employees.

Noise

Noise is becoming one of the criteria of comfort in an industrial building. Manufacturers and users are conscious of this problem. The coming year will see the advent of fan noise ratings that take into account the effect of noise on the human ear. The present decibel rating has limited usefulness for noise specifications because it does not differentiate between objectionable and acceptable noises, both of which may have the same decibel level, although each will sound different.

Typical Experience

For example, the experience of one prominent fan manufacturer typifies the problem. This manufacturer reports that customers are demanding noise ratings with the fans they purchase. They want to be certain that the fan noise will not be excessive on their particular installation. It seems that this requirement has been gaining strength over the past several years, and it can be expected to gain more momentum.

The attitude of the worker is also of direct concern to the plant engineer. In specifying and designing equipment for his plant, he, too, will have to take into consideration the comfort of plant employees and see to it that the equipment meets standards of employee comfort.

There is still a great deal of work to be done in order to clarify and accurately define what constitutes a comfort standard for heating, cooling, ventilation, noise, and other related factors. Future technical developments will be closely governed by comfort standards as they are established and become widely accepted. There is a wide gap between true comfort conditions and those that can be tolerated by industry. The final determination will undoubtedly be a compromise between comfort standards and economic considerations that may apply.

Water Supply

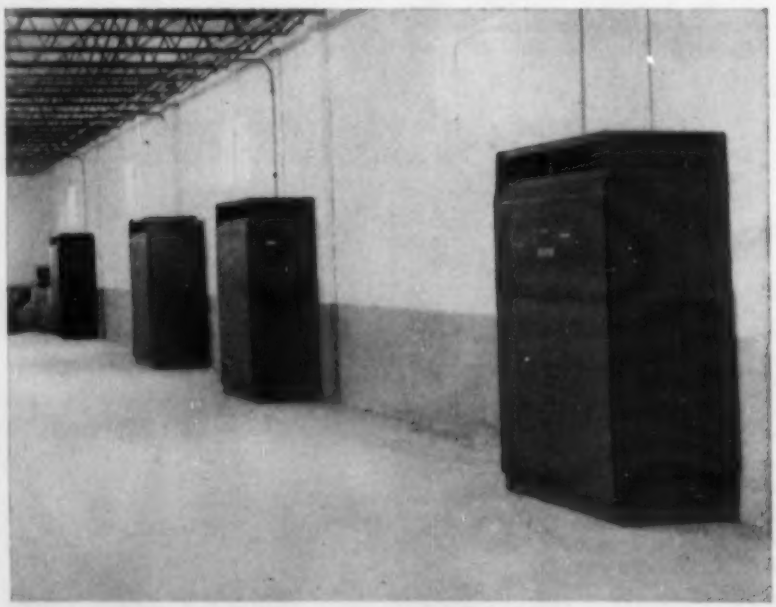
Another factor that is causing concern is the growing awareness of the shortage of our water supplies. Cities that were never expected to have a water problem—Portland, Denver, and other areas—are now passing laws requiring cooling towers or evaporators to be used with air conditioning systems as small as 3 hp in capacity.

To meet this situation, many air conditioning units—with capacities as high as 5 to 10 tons—are being built with air cooled condensers. Cooling towers and water recovery and recirculating systems are all important in conserving water. In plants located near sea water, corrosion resistant units are specified in order to take advantage of this salt water source for cooling.

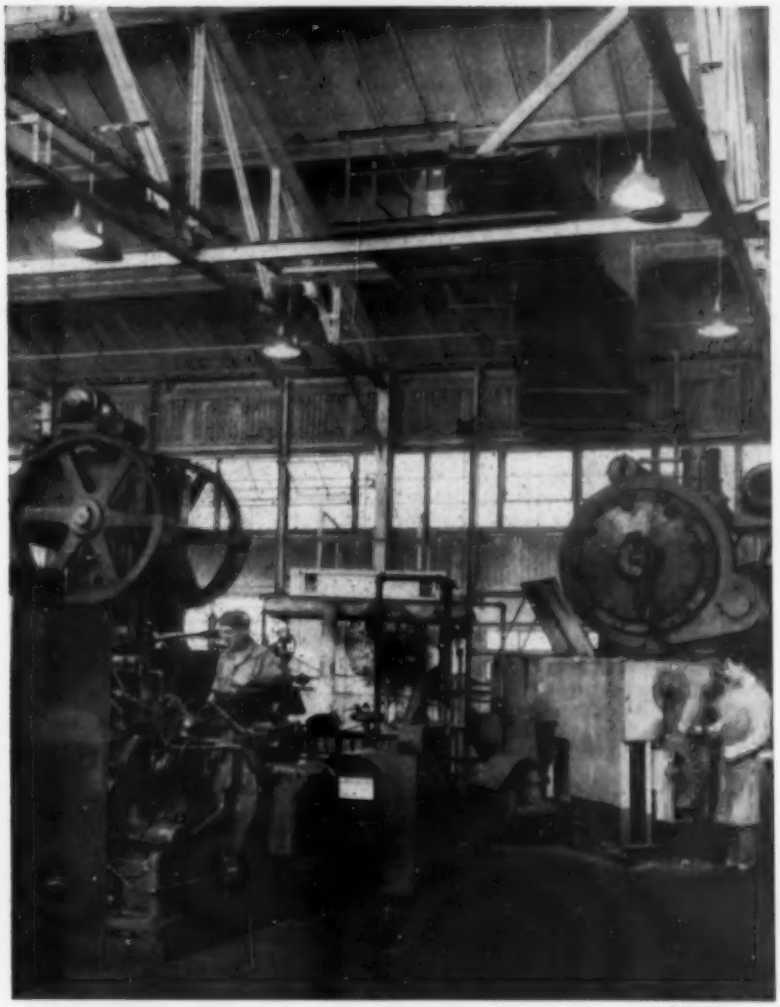
Makeup Air

Many plant engineers have faced the complex problem of properly designing their heating units, exhausters, and makeup air supply to efficiently and economically control the smoke, fumes, and heat in the plant. They have been handicapped by the lack of comprehensive practical information on how to resolve these diverse problems in their plant air handling installations.

In 1955, much more attention will be given to the over-all problem of industrial exhaust and heating systems by the equipment manufacturers. The "troublesome triangle"—heating, exhaust ventilation, and makeup air—will be considered as the basis for designing and installing the individual items of equipment to achieve the best possible system.



Seventeen packaged air-source heat pumps are providing conditioned air, for both heating and cooling, in this all-electric shoe factory in Fredericksburg, Va.



Trane Corp.

In this Michigan forge shop, 15 heating units take in outside air and supply a positive pressure inside building to force out fumes and ventilate the area.

In the design of buildings, too, more thought is being given to the use of roof monitors for better ventilation control. This is a trend that may lead away from the present flat-roof construction. The old style monitor, with ventilation provided by individually adjusted windows, is being replaced by automatically operated ventilators to exhaust heat and smoke before they reach objectionable levels.

Perimeter Heating

Another significant development has been the growth in favor of perimeter heating, i.e. the location of heating all along exposed walls replacing old time radiators or convectors. The perimeter heating arrangement can be used to advantage with either steam, hot water, or hot air systems of heating.

High temperature water heating, the term used to designate district and area heating systems that circulate water at temperatures in excess of 240 F and under pressures up to 300 psig, were introduced into this country from Europe about the time of World War II. In the last few years, there have been an increasing number of industrial applications of high temperature water systems. A forecast for 1955 indicates that this new concept of heating will live up to earlier expectations as one of the most promising developments.

When properly applied, high temperature systems have a number of operating advantages over both steam and low temperature hot water systems. High temperature hot water systems will generally work to best advantage when installed with a hot water boiler. However, in industrial plants using a steam turbine to generate power, condenser losses can be reduced by using low pressure steam in a heat exchanger as a source for the high temperature water needed in the system.

Savings in repair and maintenance costs have also been noted in these installations over a short period.

Evidence of this nature will undoubtedly stimulate further investigation by plants considering installing or modernizing their heating facilities in 1955. (The August issue of INDUSTRY AND POWER carried a feature story on high temperature hot water systems.)

Heat Pump

Packaged combination heating and cooling units are gaining in popularity. And probably one of the leading contenders in this combination field in 1955 will be the heat pump. Recently, 17 5-ton air-source heat pump units were installed in the Virginia Shoe Company, Fredericksburg, Virginia, to heat and cool the new plant. The company, employing about 300 people, is housed in a one-story insulated cinder block building in which production, assembly, and office areas total more than 25,000 sq ft in combined floor area.

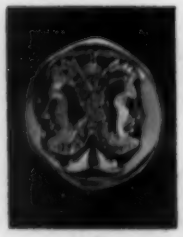
The local utility has estimated that the annual cost for heating and cooling will be about $2500. This represents a 30 percent advantage over a conventional fuel-fired system. Part of this advantage may be due to the all-electric nature of the factory and the consequent power load boost giving more favorable power rates by the utility.

The details of this installation are cited because it may represent a milestone in the further industrial application of the heat pump. The reaction in the coming year will probably help gage the acceptance of the heat pump by industry.

Future

Although atomic energy and solar collectors cannot be expected to play a significant role in 1955, and probably not for a few years after, experimental activity and progress have marked the steps of these two developments.

Waste heat from atomic reactors is being successfully used to heat buildings at the Hanford plutonium plant at Richland, Washington. Solar collectors have also had some residential success in transforming energy from the sun into usable heat. However, both of these developments must necessarily be made commercial before there can be any decision on industrial applications.



ANNUAL REVIEW AND FORECAST

Diesel and Gas Engines

Higher Supercharging Pressures

A FEW KEY words—supercharging, dual-fuel, standby power—probably pinpoint the major trends in the diesel and gas engine field in 1954. As for the 1955 forecast, we will certainly anticipate further strengthening of these trends.

Current Activity

More and more supercharging can be expected at increasing supercharge pressures. The coming year may also see the commercial introduction in the U.S. of supercharged two-cycle diesels.

Spark ignited gas engines operating on a modified diesel cycle offer advantages that tie in directly with the low cost of gaseous fuels in some locations. Gas transmission lines radiating from the Southwest will open many new markets and possibilities for these gas engines.

Diesels as standby power have proven reliable, economical, and efficient in many industrial plants. They will continue to gain acceptance in this field.

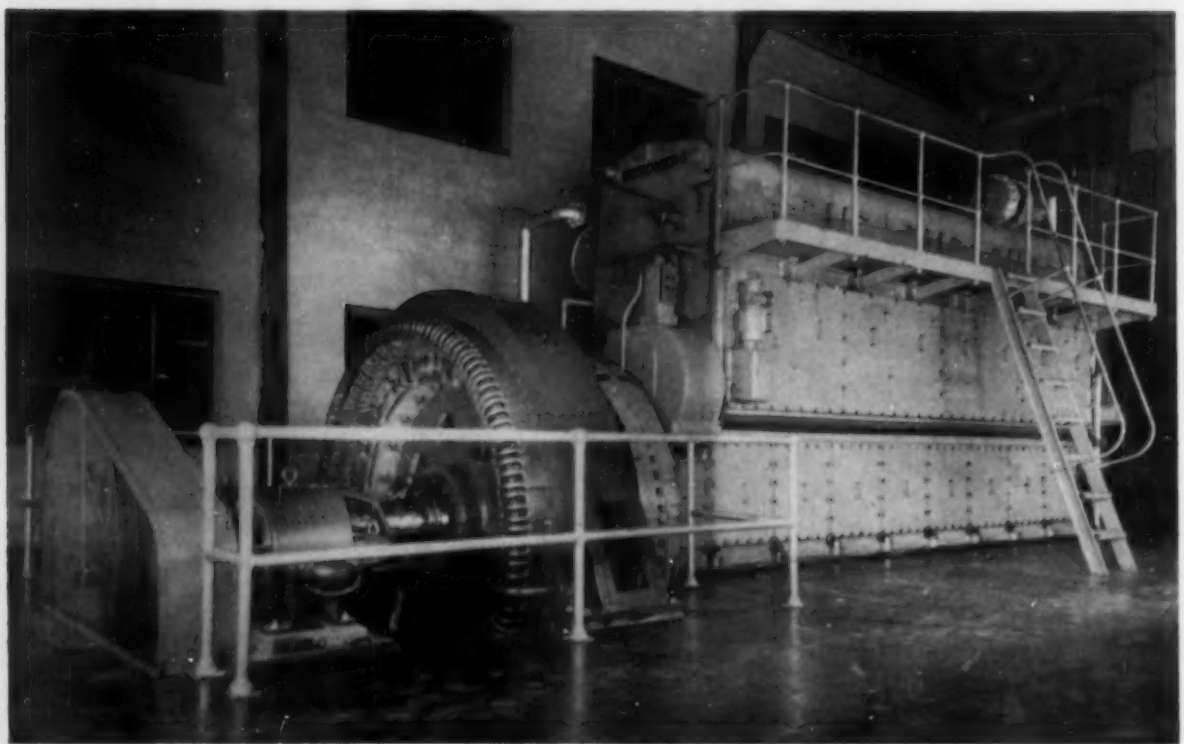
While it is especially difficult to predict future developments in the diesel field because of the secrecy with which each manufacturer surrounds his research and test progress, attention is being directed to the interesting possibilities offered by combination of the free-piston gas generator-gas turbine assembly.

The most interesting development in supercharging in recent years is a method of utilizing the high output turbochargers available today to supercharge two and four cycle diesel engines and to obtain a very high specific output without exceeding the engine's safe thermal load. The method was invented and patented by Ralph Miller, a Milwaukee consultant, and is called the Miller System of Supercharging. It depends essentially on varying the timing of the inlet valve of the engine. To date, approximately 200,000 bhp (total) have been successfully installed and are operating on the Miller System.

Miller System

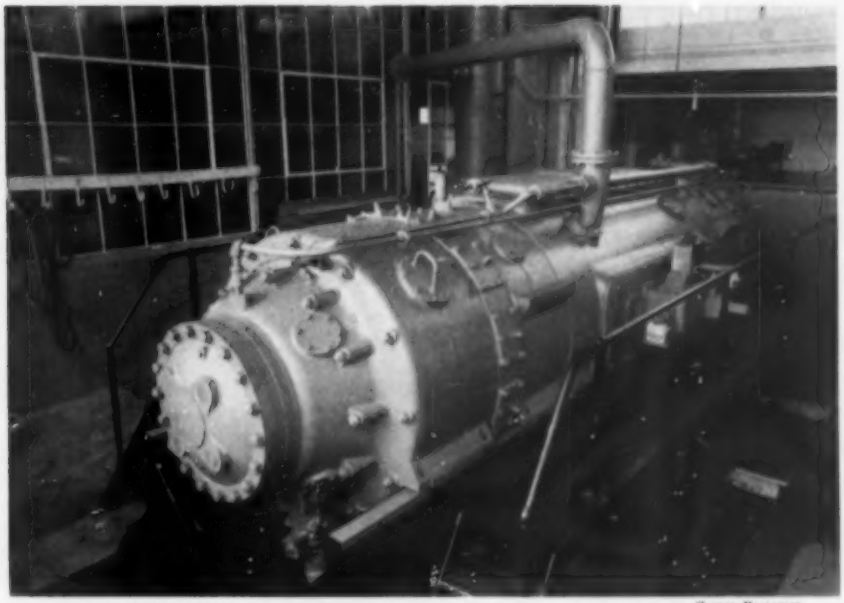
The Miller System offers the possibility of obtaining further gains in specific output as more efficient turbochargers with higher discharge pressures become available.

Even more promising, recent tests indicate that the Miller System of Supercharging can be applied to two cycle engines to obtain the same desirable characteristics as the four cycle applications while at the same time almost doubling the hp output with lower fuel consumption. (Articles discussing the Miller Supercharging System have appeared in



Nordberg

This new diesel uses a supercharging system in which the timing of the inlet valve is varied to permit higher output.



Cooper-Bessemer

Cooper-Bessemer 1500 hp free piston gas turbine on test stand in the laboratory.

the October and December, 1954 issues of INDUSTRY AND POWER.)

The dual-fuel diesel engine, designed to operate either entirely on gas, entirely on fuel oil, or on a varying mixture of each, was developed to utilize the available low-cost gas fuel in the Southwest. As major gas transmission lines have continued to make gas available in Eastern and Midwestern industrial centers at prices competitive with fuel oil, the dual-fuel engine has also found wide use in these areas. Today, because of the recognized operating economies, approximately 85 percent of all the larger size diesels manufactured are designed as dual-fuel engines.

Gas Engines

However, as the reliability and adequacy of gas supply systems becomes firmly established, the tendency will be to simply design a straight spark ignition gas engine operating on a modified diesel cycle. These engines are expected to operate at efficiencies up to 42 percent. Fuel consumption will average about 6100 btu/bhp hr.

If this anticipated performance is realized in actual field operations, the diesel engine will probably make further inroads in the power and industrial areas now using equipment having much lower operating efficiencies than these engines.

It is interesting to note that heavy residual fuels are now in use with engine-generator sets as small as 1000 kw. Most installations in the past history of heavy fuel burning (stationary units) had been of 1500-2000 kw or above. The importance to industries producing any part of their own power, or considering what part to produce and what part to purchase, is that while formerly a greater investment was necessary to operate a heavy fuel engine, now less initial investment and the smaller size of the unit has expanded the market for this method of power production considerably.

Standby Power

Progress is definitely being made in using diesel prime movers of all sizes for standby power. Dependence on outside power alone is beginning to cause concern, especially in those plants having continuous manufacturing processes. The trend toward diesels as standby power will continue to grow as long as diesels can start and take over the load immediately, occupy a minimum amount of valuable floor space, and offer a low dollar-per-hp investment.

Free-Piston

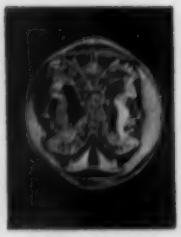
The fact that the General Motors Corp. is now openly exploring the free-piston field alongside the development work already being carried on by other U.S. engine manufacturers, notably the Cooper-Bessemer Co. and the Baldwin-Lima-Hamilton people, leads to the reasonable assumption that accelerated progress can be expected in developing commercial applications for industry on this revolutionary engine concept. G.M. has purchased rights to U.S. development and manufacture of the French Pescara engine; the original free-piston.

Turbine Combination

The major advantages that are claimed for the combination free-piston gas generator-gas turbine are: The unit combines the high thermal efficiency of the two-stroke diesel cycle with the flexible power take-off characteristics of the turbine. It offers many varied and different possibilities for industrial application. Many of the moving parts (crankshaft, connecting rods) of the conventional diesel engine are eliminated in the free-piston design.

Difficulties holding back application of the free-piston machine, in the opinion of some authorities, can be summed up as high oil consumption and excessive ring and cylinder wear, as well as the fact that these engines have not been successfully operated on gas.

A recent announcement called attention to experiments being planned by the Maritime Administration in testing new propulsion plants for merchant ships. The propulsion units that will be tested include a gas turbine, a steam turbine, and the new free-piston plant. These experiments and their operating results will help pave the way for evaluating the future potential of the free-piston gas generator-gas turbine in industry.



ANNUAL REVIEW AND FORECAST

Industrial Lighting

Brightness and Color Get Attention

Jones and Laughlin Steel Corporation

Seamless tube department benefits from excellent lighting of high-bay units. Notice that the extensive catwalks are clearly and fully illuminated.

The Edwin F. Guth Company

Supplementary lights were discarded when new general lighting was put in. Intensity of 12 ft-c was raised to 75 ft-c, with 7 percent "free uplight."

PROGRESS IN industrial lighting is measured today by yardsticks previously neglected to a great extent. Intensity remains important. But brightness ratios, color quality, and glare are among other vital factors coming in for more attention.

There is growing awareness that effective illumination depends on the responses of humans rather than on any such arbitrary standards of illumination as intensity. As a further example, there is concern that too much emphasis is placed upon fixture efficiency for its own sake, without regard for the really fundamental criterion — worker efficiency.

Eye Comfort

Though considerable work has yet to be done in determining how to adequately measure eye comfort, knowledge already available is being put to use. It has been determined, for instance, that nervous shock occurs when workers shift their sight from bright areas to dim areas. The resulting eye fatigue becomes serious when illumination brightness on a task area (or light-source surface) exceeds by a ratio of 10 the intensity of the surrounding visual field. Yet, it is very common to find plants where brightness ratios are 100 to 1. Cases exist where brightness ratios are 250 to 1.

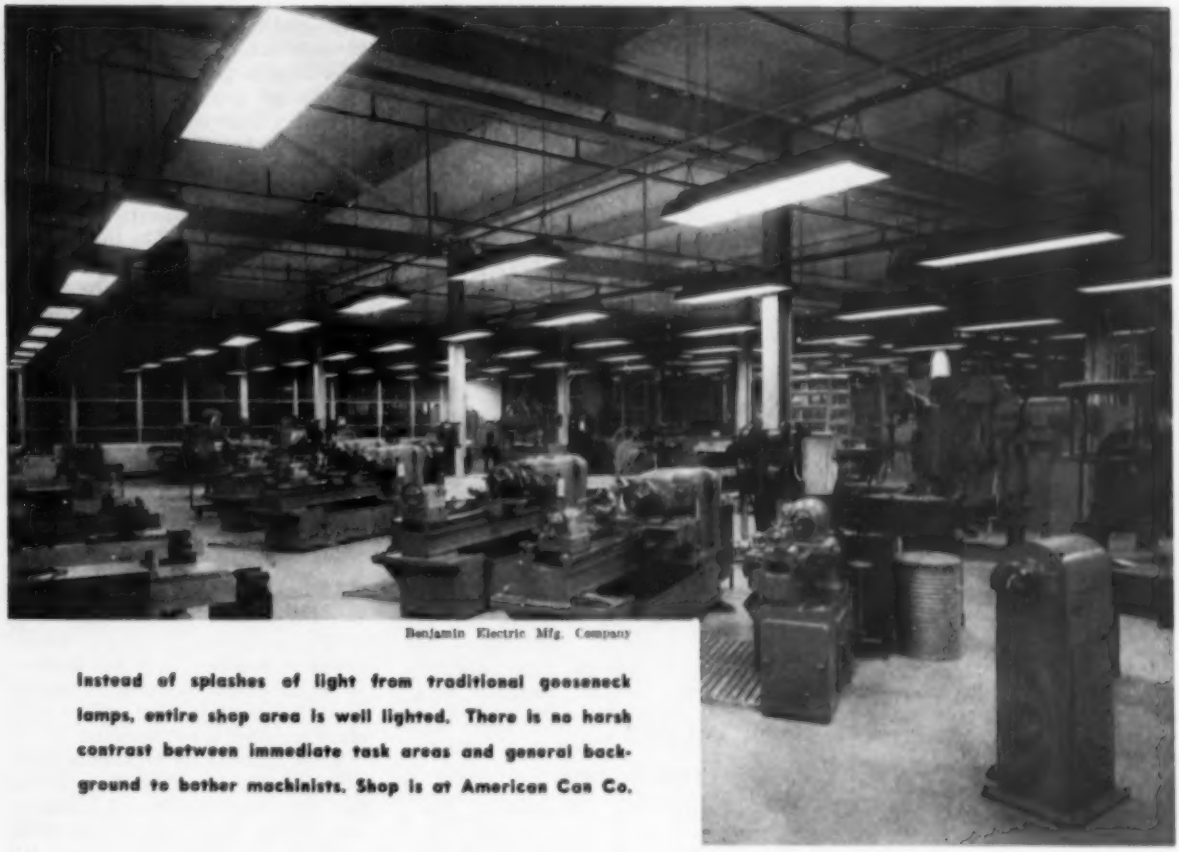
The continued popularity of fluorescent fixtures (for mounting heights up to 40 feet) relieves brightness ratio problems because the fluorescent fixture distributes light from a large surface rather than from a bright, intense spot. This reduces contrast between the light source and the fixture background.

The latest fluorescent fixtures go even further in reducing brightness ratios by casting some light upward to reduce the contrast between the fixture and its background. Fixtures are available that provide 7 percent up-light with no reduction in downward lighting. The apertures for up-lighting permit ventilation that keeps lamps cool and reflectors clean. As much as 40 percent up-light is provided by some fixtures; 25 percent is common and is widely recommended.

Room surfaces are being painted light colors to reduce brightness differences and to reflect more light. General illumination can be increased as much as 25 percent by proper painting of walls and ceilings.

Smooth Ceilings

The swing toward up-lighting is encouraging a definite trend toward low, smooth, uncluttered ceilings. Soundproof ceilings with recessed



Benjamin Electric Mfg. Company

Instead of splashes of light from traditional gooseneck lamps, entire shop area is well lighted. There is no harsh contrast between immediate task areas and general background to bother machinists. Shop is at American Can Co.

fixtures are being used for large areas, particularly where small parts are being handled. Of course, high-bay areas are still required in industry, and another approach to good lighting must be used for them.

Mercury vapor lamps are becoming more popular for high-bay areas. It is estimated that sales of mercury vapor lamps have increased some 25 percent in the last year as the result of color correction features recently introduced. They are economical. Their concentrated brightness is not objectionable when they are mounted high.

Mercury and Incandescent

Because mercury lamps require several minutes to relight, even after a power failure of only a few seconds, incandescent lamps will continue to be used with them to provide minimum light following power interruptions. But the role of the incandescent as a color balancer is passing from the scene as color-corrected mercury lamps become more widely used.

Current installations commonly provide general levels of 50 foot-candles at work surfaces; 75 and 100 foot-candles installations are going in. Such areas as precision machine shops are getting 125, and even 140 foot-candles.

Definite Improvements

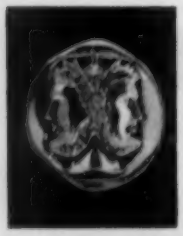
Better lighting does pay off. In one high-bay area, accidents dropped 32 percent when general illumination was raised from 5 to 20 foot-candles. After painting to reduce brightness contrast and conserve light, accidents dropped another 11 percent. Similar cases are on record, such as one where a change from 16 foot-candles to 70 foot-candles raised production 10.5 percent and reduced rework costs 39.6 percent.

Group replacement of lamps and mass cleaning of fixtures on a programmed basis continue to gain acceptance because dirt can depreciate light output as much as 60 percent. Plant engineers find that it is more economical to clean all fixtures together and often. Because the unit cost of replacing a lamp is very much lower under a group relamping program than on an individual basis, plant engineers find it more economical to replace all lamps at 60 to 80 percent of expected life, even though it means buying a few more lamps.

The trend to higher intensities of general illumination is reducing the need for supplementary lighting of particular task areas. Bright splashes of supplementary light against dim backgrounds create many brightness ratio problems in themselves. Such problems disappear when high-intensity general illumination eliminates need for supplementary lighting. Certain tasks — notably inspection — may continue to require special kinds of local lighting, such as large-area with low-brightness fixtures, black light, directional lighting, or transillumination.

High-Frequency Lighting

The most revolutionary development on the horizon is the 400-cps-system of fluorescent lighting. It promises lightweight and low-loss ballasts and fixtures, greater freedom in fixture design, higher overall efficiencies for equal light output, lower operating costs, more lumens per lamp, less heat loss in fixtures, and less branch wiring. Indications are that ordinary 60-cps wiring systems can be used without excessive losses or voltage drop.



ANNUAL REVIEW AND FORECAST

Compressors

Trimmer Designs... Less Vibration

WHEN SELECTING compressors for plant air supply, it is considered good engineering practice to provide 20 percent more capacity than the actual air requirements to allow for increased use of compressed air. This practice reflects the rapid growth of compressed air usage and emphasizes that such growth can be expected to continue.

Because of its versatility, it is being used wherever practical in new production facilities. It also is favored by the trend towards automation, since many instruments and controls are pneumatically-operated and many former manual operations are being accomplished with relatively simple air-actuated mechanisms.

Another contributing factor is the growing acceptance of pneumatic tools. The present sales volume of the air tool industry is over 2½ times greater than it was in 1946.

With the increased use of pneumatic tools, plant engineers are finding it desirable to have a portable compressor on hand for maintenance and construction work. An independent unit eliminates long, pressure-robbing lines.

As a plant uses increased amounts of air, line losses take on added importance. To reduce these losses, some plants, particularly those with several buildings, are decentralizing by installing compressors at various locations close to the points of use.

Wherever pressures higher than the normal line pressure are required, booster compressors are gaining acceptance. They also are sometimes used to maintain pressure to machines or processes using large surges of air.

Compressor Designs

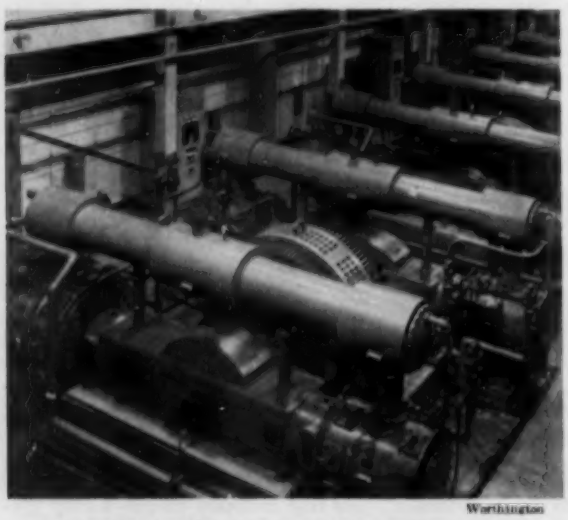
Reciprocating compressors normally are used to meet plant air-power requirements. The trend is toward the opposed-cylinder, balanced design units. These units feature an unusually wide range of pressures and capacities. Perhaps their most important advantage is their versatility. They can be driven by almost any type of drive and they have very low shaking forces. They also are used for refrigeration and vacuum service.

Where large quantities of air at relatively low pressures are required, dynamic-type compressors —both centrifugal and axial types— are gaining wide acceptance.

Centrifugal compressors deliver almost constant pressure over a wide capacity range. Used by the steel and manufactured gas industries for many years, they are now finding applications as pipeline boosters, refinery air and gas compressors, exhausters for continuous rotary filters, scavengers for diesel engines, blowers for pneumatic conveyors, forced draft for pressurized boilers, and as refrigeration compressors. In the future, they may find application in very large plants for base load operation in plant air-power systems.

Although axial compressors have not been as widely used as centrifugals, recent improvements in their operating characteristics make their future promising. Having a limited range of stability, they are confined to applications needing extremely large, constant volume, where constant pressure is not essential.

Their capacity for high-flow, high-efficiency levels makes them attractive for wind tunnels and industrial gas-turbine power plants. Development of the axial compressor has been tied closely to that of the gas turbine. Recent tests showing that blast-furnace gas can be used in gas turbines therefore indicate that axial compressors may soon be used by the steel industry for blast furnace charging and as a component of gas-turbine power generation.

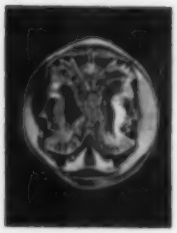


Worthington

Balanced-opposed compressors feature unusual versatility. These units are at Ford's Cleveland Motor Plant.

Ingersoll-Rand

Tandem centrifugals compress gas from 4 to 205 psig in a West Coast refinery. Other unit is a turbo-blower.



ANNUAL REVIEW AND FORECAST

Heat Exchangers

A Move Toward Standardization

HEAT EXCHANGERS probably cover the broadest range of service conditions in all industry. Boilers, evaporators, deaerators, feedwater heaters, economizers, air heaters, steam condensers, condensate coolers, cooling towers, waste heat reclaimers, gas turbine regenerators, engine jacket-water coolers, oil coolers, space heating and air conditioning coils, and various other items of process equipment all rightfully belong in the heat exchanger classification. Most engineers, however, think of heat exchangers in terms of either shell and tube type or contact type heaters and coolers.

Since the transfer of heat from one substance to another affects the thermal balance of any process — and in turn its operating economy — all of the items in this field are extremely important. Fortunately, most manufacturers specialize in the production of specific units and narrow their efforts to particular service conditions. Some concentrate on high velocity, forced recirculation water heaters that provide extremely uniform temperature control. Others specialize in torque converter oil coolers, transformer oil coolers, or similar component equipment items.

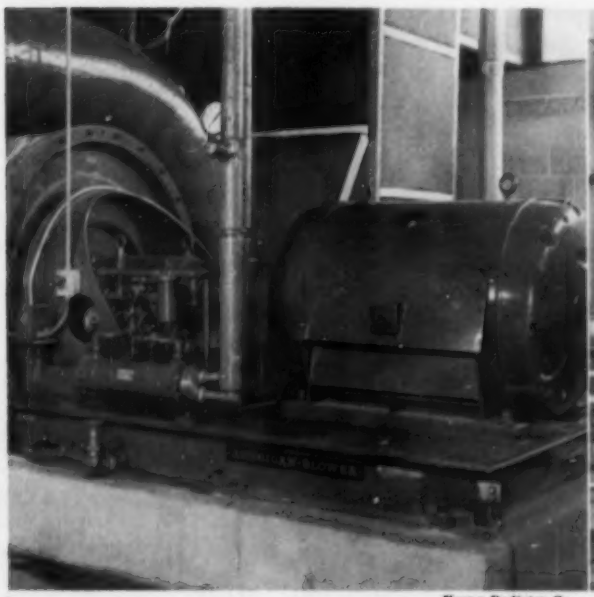
Current Trends

Reports from manufacturers indicate two principal factors are influencing their operations. One is customer demands for faster delivery and lower prices. This is placing great emphasis on standardization of units for moderate temperature and pressure conditions. The other is the never ending economic demands of competitive enterprise. Manufacturers find their answer to this problem in the efficient use of the currently available, fine materials to get more compactness — in short, the transfer of more Btu per pound of material employed in the manufacture of the product.

When the possible combinations of baffle spacing, shell diameter, tube length, and pass arrangements are considered, the problems of standardizing shell and tube exchangers are self evident. In addition, heat exchangers for extremely high pressure-high temperature or very low temperature services impose design restrictions individual to each project. But manufacturers are meeting the challenge. Methods are available for fabricating, welding, and finishing equipment in stainless steel, a combination of dissimilar metals, aluminum, Monel, copper, nickel, lead, and numerous other materials. New self brazing techniques permit the production of complex design aluminum exchangers, principally for gas to gas transfer, at relatively low cost. Where the service conditions demand it, shells can be lined with various resistant materials.

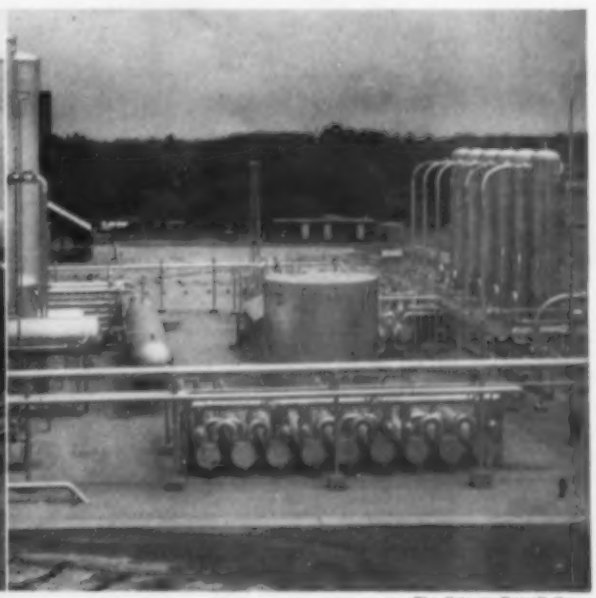
Packaged Units

Contact type heaters are being packaged in numerous sizes to meet almost every possible capacity requirement. Some manufacturers of shell and tube exchangers find it more expedient to standardize on component parts, from which they can readily fabricate and ship an assembled unit. All designs, however, show the imprint of the more exacting service conditions and the advances in materials technology.



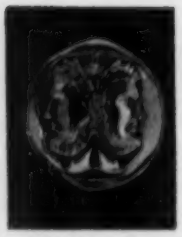
Young Radiator Co.

This shell and tube heat exchanger cools bearing lubricant on a 500-hp, centrifugal type blower serving a wind tunnel.



The Griscom-Russell Co.

Photo shows a typical outdoor installation. These units are absorbtion oil exchangers at a natural gas plant in Texas.



ANNUAL REVIEW AND FORECAST

Mechanical Power Transmission

Variable Speed -- Ease of Assembly

NEW DESIGNS and innovations have appeared in almost every segment of the power transmission field. Manufacturers have been aware of the customers' demands for products that are more compact, easier to install, remove, and replace. They have been particularly sensitive to the need for readily available distributor stocks so that plant inventories could be reduced to a minimum. And there has been the common motivation to design products that will last longer, operate more efficiently, require less maintenance, and sell at lower costs.

Shaft Mounted Drives

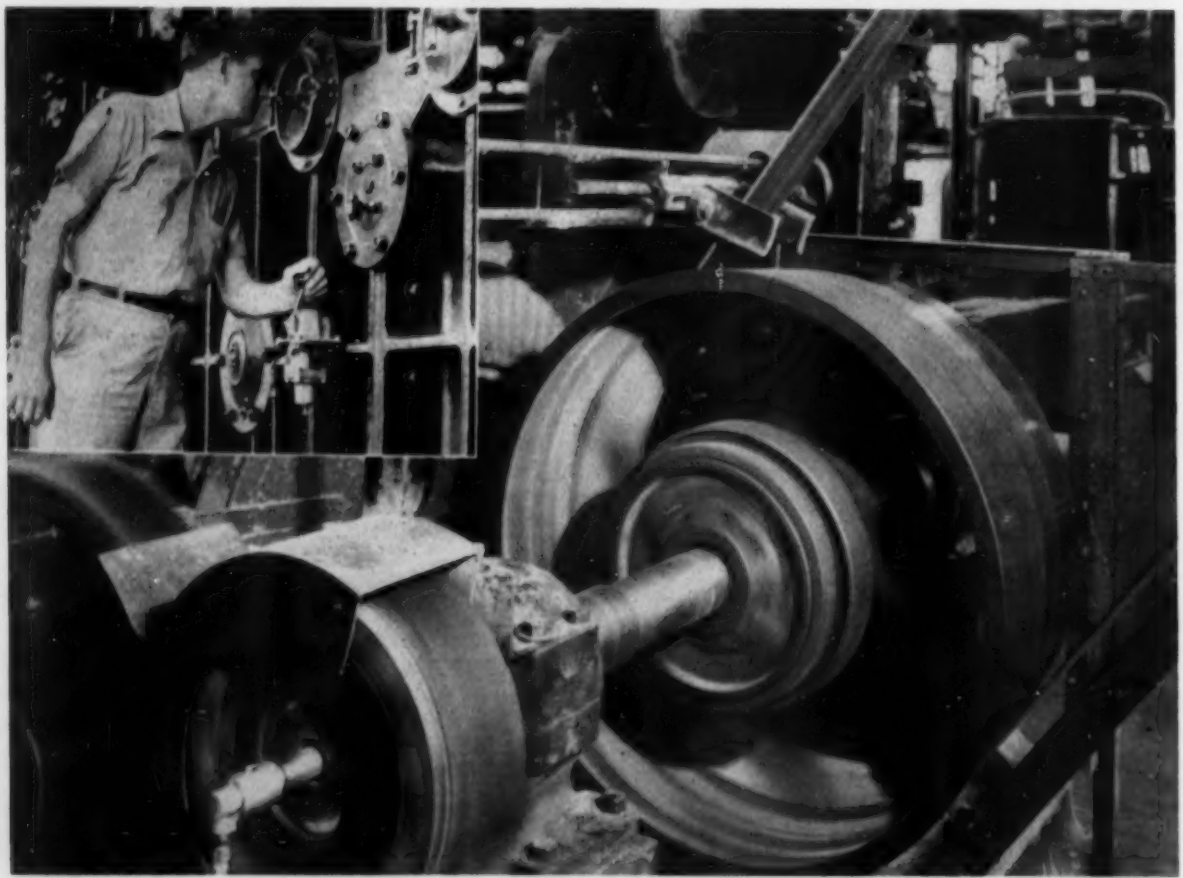
The introduction of the shaft mounted drive met with immediate acceptance by industry. Because it offers high mechanical efficiency (97 to 99 percent), requires no foundation, sliding base, or flexible coupling, it has proved to be an economical solution for the many applications that require efficient speed reduction in a limited space.

Having demonstrated conclusively its ability to deliver more power at less cost, further developments in shaft mounted speed reducers can be expected to increase the range of usefulness of this mechanism.

Taper-Bushed Sprockets

The trend towards the greater use of the taper-bushed principle of mounting wheels—such as sprockets, sheaves, couplings, and conveyor pulleys—received further impetus in 1954, when several major manufacturers of roller chain and sprockets announced the extension of the taper-bushed sprockets to include chain sizes up to American Standard Chain No. 160 with a pitch range from ½ inch to 2 inches.

The ease and speed with which taper-bushed wheels can be mounted, removed, and replaced is part of the reason for their popularity.



Dodge Mfg. Co.

A new Air-Grip clutch installed on the drive of the dryer section of a pulp machine. Clutch is controlled with air valve.

Standardization on these taper-bushed products, permitting more flexibility and interchangeability (which means savings in time and money for the plant engineer) are a further explanation.

In the coming year, manufacturers will do everything possible to introduce new features in power transmission equipment that will help increase the productivity of the worker. For example, a new air activated clutch recently placed on the market has finger tip control, gives instant response, runs cooler, is better ventilated, and appeals to the operator because it simplifies his work, decreasing strain and fatigue.

Hydraulic Transmission

Some plant engineers, confronted with the problem of installing machinery to meet the demands for automation, are using hydraulic power transmission equipment to solve their problems. The tendency is to specify that the basic sytems be incorporated integral with the fluid power unit of the transmission.

There is an increasing need for drive applications where accuracies in speed regulation from 0.1 to 0.5 percent are essential. This need, among others, accounts for the trend towards variable delivery pumps with hydraulic motors that can efficiently convert constant speed mechanical motion into almost any desired speed with exceptional accuracy and regulation.

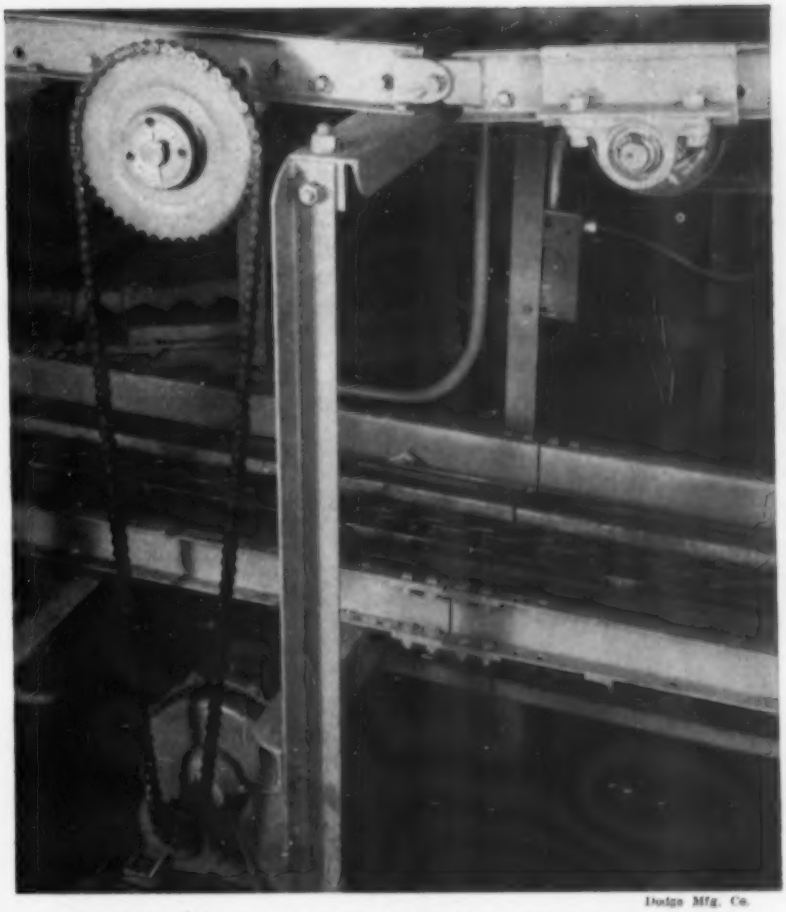
All-Electric Drive Systems

One very effective type of power transmission is the all-electric adjustable speed drive system. Introduced some years ago, it has continued to win popular acceptance. In this system, an adjustable speed drive motor receives d-c power from a motor-generator or electronic conversion unit; the conversion unit operates from a standard powerline a-c. Because of inherent features of controlled acceleration and deceleration, an infinite range of stepless speeds, and elimination of mechanical transmission parts, it will continue to find many uses as an industrial drive mechanism.

Standardization

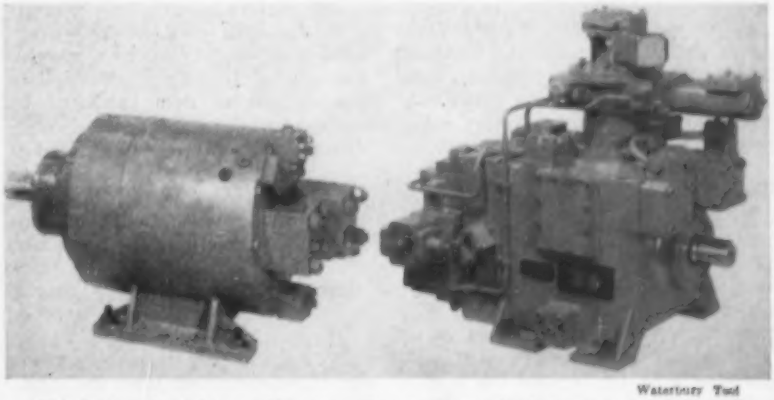
To facilitate mass production of the growing variety of styles, types, and sizes of power transmission units, manufacturers have adopted the technique of standardizing on the basic elements that comprise these units. For instance, the same housing may be used on an in-line horizontal, a right angle horizontal, a right angle vertical, and an in-line vertical motor reducer with each style offering the choice of a wide range of sizes and ratios. Such standardization will reflect in lower costs for these items and will ease replacement and inventory problems.

Engineering advances, designs, and production techniques can be counted on to produce more refinements, broader applications, and new products to meet the power transmission requirements in the year ahead.



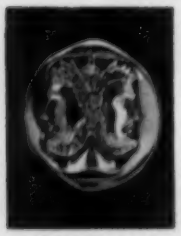
Dodge Mfg. Co.

This sprocket, used on can conveyor in beverage plant, uses a Taper-Lock to hold it on the shaft. This shaft fitting method permits easy assembly.



Watertown Tool

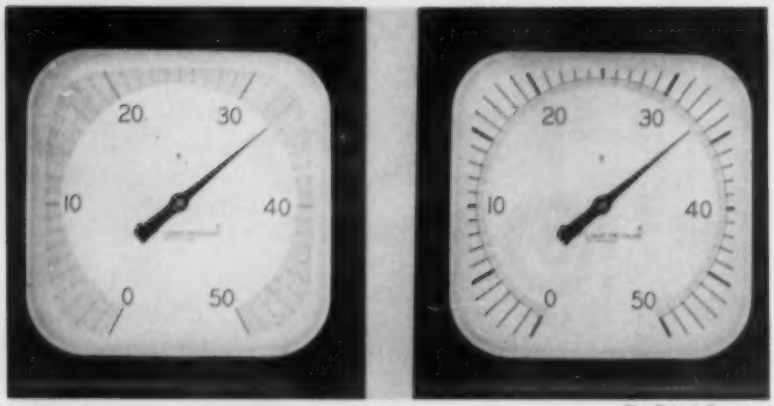
This hydraulic drive, making use of a constant displacement motor and a variable delivery pump, provides accurate speed control over its full range.



ANNUAL REVIEW AND FORECAST

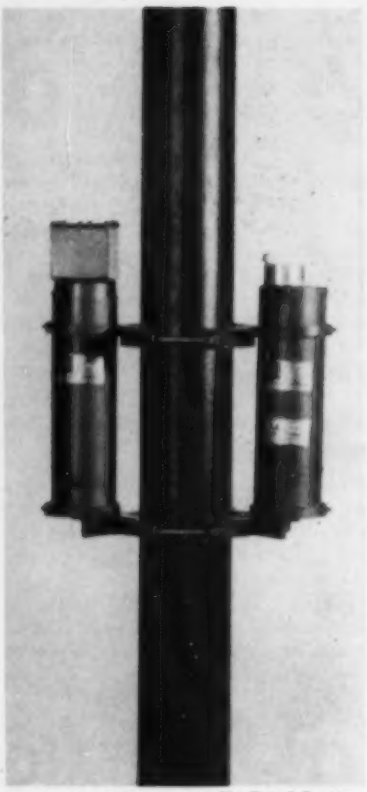
Instrumentation and Control

Complex Systems Being Simplified



The Bristol Company

To help improve comprehension by operators viewing masses of displayed data, new dials (right) having better readability are replacing old dials (left).



The Bristol Company

Gamma radiation between cylinders monitors density of fluid in pipe.

THE GROWING POPULARITY of the word "automation" is calling renewed attention to the vital role played by instruments and controls in the nation's industry. Automation has come to be associated with relieving the burden on man's muscle. But the thing to look for in the future is increasingly widespread substitution of instruments and controls for man's sensory perceptions. For the present, however, there is some sober thinking that the popularity of "automation" as a word has far outdistanced "automation" as a reality. The automatic process is reality, but such processes will have to become far more prevalent before the automatic factory becomes commonplace.

Even in plants not yet "automated," there are already so many significant variables to be monitored that a definite trend has developed toward multi-function and miniature instruments. These instruments, often arranged in a graphic panel, permit an efficient display of data that would otherwise present an array of data far beyond the comprehension of any operator. The graphic panel found its initial acceptance in process plants, but today it is being installed in many power houses. Many more graphic panels are predicted for 1955. Limitations, though, do exist in graphic panels as the number of small instruments to be crowded into a given display area are increased. (Standard panels with miniature instruments are smaller than graphic panels with miniature instruments.)

Data Reduction

Where the concentrations of significant process data become overburdening, data reduction systems are coming into favor. They limit the amount of data exhibited by feeding process information directly to computers. The computers simulate the process. The effect of change in any process variable will initiate computation and dispatch of a compensating correction. The correction comes fast enough to effect an adjustment before significant change in the process output is detectable.

Recognizing that machines cannot think but can only keep score, modern instrumentation frees the intelligence of the human to tend to the decision-making tasks called for by off-normal conditions. The trend is to present the operator with nothing more than indications of impending trouble or of trouble itself. The operator's attention is not taken up with continually confirming that all is well.

The use of electronics in instrumentation is becoming more popular. With transistors and magnetic amplifiers to replace the less reliable vacuum tube, dependability is increased to the point where it no longer deters the use of electronic gadgetry. Transistors in proper circuits offer indefinite operating life. They are capable of efficiencies better than 90 percent. (A Class A amplifier may have an efficiency of 50 percent.) Even among process people, there is evidence of weakening in the historic opposition to electronic or electric control on the ground of explosion hazard. In fact, a petroleum refinery with all-electronic instrumentation is now in operation.

More Plug-Ins

The design of modern instruments shows an awareness of industry's increasing dependence on instru-

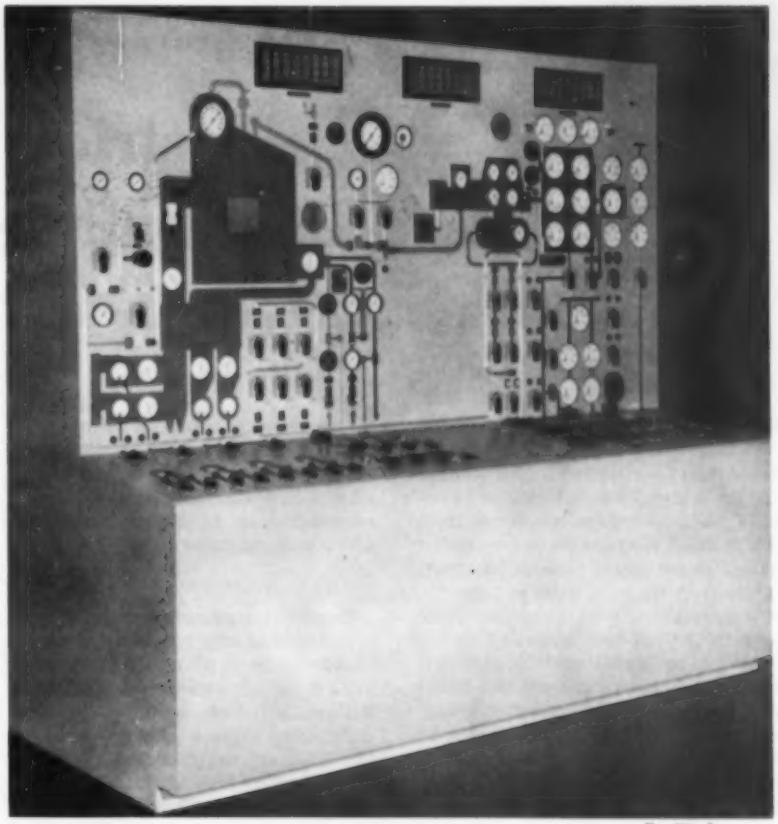
mentation. More and more emphasis is placed upon the plug-in feature. With it, faulty units can be replaced in as little as 10 seconds without disturbing the process. A controller, indicating unit, or recorder can be plugged into a given point in a process, depending on particular needs at the time.

Instrument faces are being restyled for increased readability. Techniques using radioactive materials for measurement and gaging are becoming more popular. New accessories are constantly being announced that extend the usefulness of television in the industrial field. In-stream product analysis continues to be popular.

With all the emphasis being given to instrumentation, the traditional requirements of lower maintenance cost and dependability still exist. Safety and simplicity are being demanded, too.

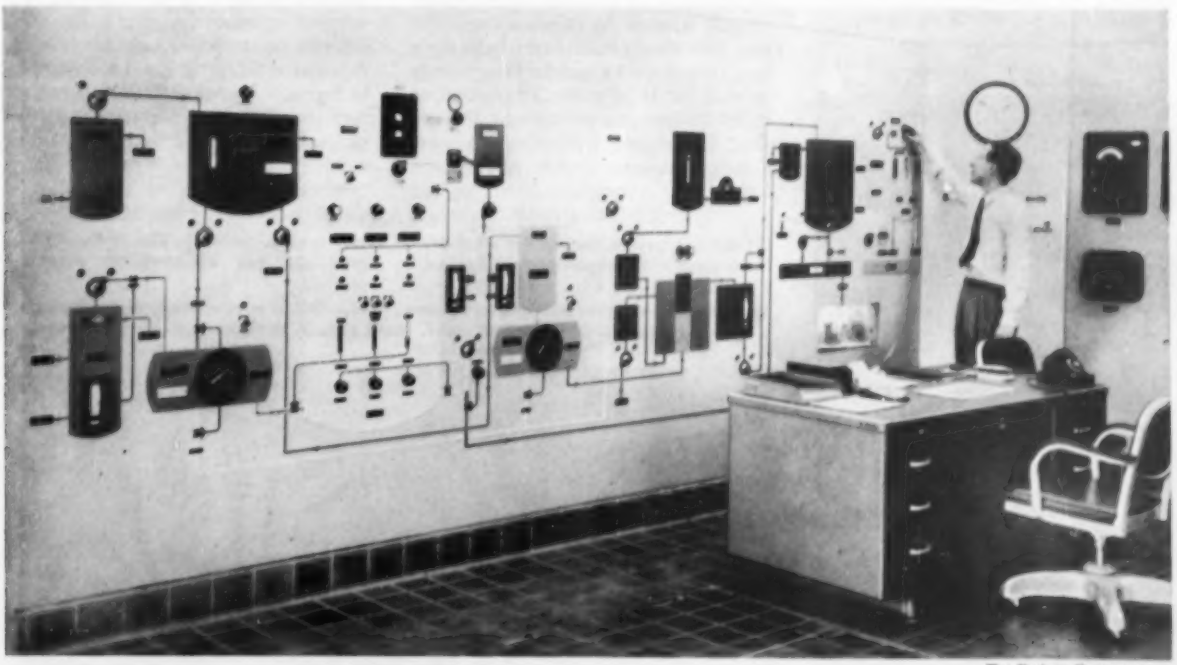
Measure of Progress

More detailed instrumentation of the nation's industry seems to be destined for the future. The distance already traveled is aptly illustrated by a quick look backward. It is said that the petroleum industry, for example, would require four times more crude and its output would cost five times present prices if it had to operate with manually controlled equipment.



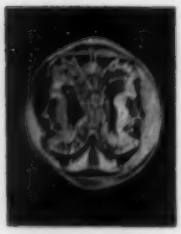
Panellit, Inc.

This 8½-foot panel controls an 80,000-kw boiler-turbine-generator unit. Designed by Ebasco Services, it is in use in Texas Electric Service plant.



The Foxboro Company

This is a graphic panel for the control of a cyanide treatment and silver recovery plant installed at the Oneida, N. Y. works of Oneida, Ltd. This is one of the first graphic panels to be built for use with an industrial waste treatment plant.



ANNUAL REVIEW AND FORECAST

Electrical Distribution

Concern Over Available Fault Currents

TODAY'S thinking about industrial electrical distribution systems is marked by a renewed appreciation for the increased magnitude of available fault currents resulting from additions of new generating capacity. While phenomenal growth has been effected in terms of system capacity, it is now dawning on many that these additions to plant capacity bring with them additions to potential fault currents — and potential trouble. Many plant engineers are finding that the increased magnitude of available fault current is making their present protective equipment inadequate.

Load growth has historically taken the form of increased power density per unit plant area. (See INDUSTRY AND POWER, August, 1954.) This trend will be intensified as thinking in terms of automation takes firmer root. Automation shrinks plant areas, while increasing electrical load. Factories have been cited where automation has increased production to the point where plant area is substantially reduced.

Organize Maintenance

Because so many production eggs are placed in any automated basket, maintenance of plant electrical systems is being organized on a team basis — each team being assigned to watch-dog a given area within the plant. Thus, maintenance is being specialized by area, as it has been by craft, to shorten the delays due to long trips from a central shop to a distant fault.

In addition to interrupting duty, another serious problem is that of voltage dips. With increased interdependence of manufacturing operations related by automation, the loss of a single motor can hold up a long sequence of production events in tandem. Dips to but 80 percent of rated voltage for as little as 1½ cycles are causing trouble in some plants. Because more plants are moving out from the cities and are therefore being served by overhead lines, susceptibility to voltage dips on industrial systems can be expected to increase.

Another major change in the looks of industrial distribution systems is in the supplying of lighting and power circuits from a 480Y/277-volt power supply. It has long been pointed out that savings amounting to 45 percent of lighting systems costs could be effected by feeding lighting and power from one circuit. Look for more and more acceptance of this idea.

Systems equipment is being designed for operation at higher temperatures. This includes such items as dry-type transformers, wire and cable, and rectifiers. Selenium-type rectifiers are available in a wide range of ratings for operation at 125 C, with no derating from room-temperature ratings.

The newest classes of equipment to be hung on industrial systems in greater quantity will be electronic devices and air conditioning. Within the next 10 years, it is estimated that the use of industrial electronic equipment will expand to seven times present levels.

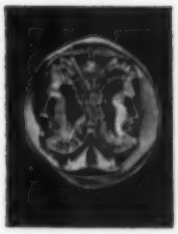
In recent months renewed attention is being called to copper as an electrical conductor. Copper production is expected to increase by a fourth within a year. Aluminum is being made available for bus conductors in new grades having increased mechanical strength with little or no reduction in conductivity. A trend picking up great momentum is increased availability of connectors on original equipment suitable for use with both aluminum and copper conductor.

I-T-E equipment in Public Service Electric and Gas Company

Molded case breakers for load center (left) feed auxiliary power at Kearny Station. Dry-type transformer is rated 225 kva at 4160-220 volts.

Bus duct continues to enjoy wide acceptance. This is part of Caterpillar Tractor Co. system in its Joliet plant. Note plug-in grounded phase indicator.

Caterpillar Tractor Co.



Industrial Fire Protection

Major Fires Followed by Progress

IN 1954, the "soul-searching" started by the GM Livonia fire continued throughout all phases of plant fire protection practice. In many plants, hazardous areas have been put under complete sprinkler protection. Also, special hazards have been recognized as requiring independent carbon-dioxide, foam, or dry chemical protection.

Roof Construction

Plant designs, especially roof constructions, have been studied in an effort to eliminate those designs that prevent proper removal of smoke and heat from buildings, as well as to eliminate those materials that have a tendency to spread and feed a fire — by dripping tar or asphalt.

There is evidence to indicate that the various systems of issuing permits for burning or welding in hazardous locations in the plant have been strengthened by closer supervision and regulation. These are some of the high points as manifested in this past year.

Spray Sprinklers

Because it has been conclusively demonstrated that a fine water spray is more effective and efficient in extinguishing fires than the discharge from a normal sprinkler head, the new spray sprinklers have come into wide use in new installations and as replacements for the older-type heads. The Associated Factory Mutual Laboratories and the Underwriters Laboratories, Inc., representing the fire insurance industry, have fully recognized the value of the spray sprinkler and have set up standards of performance for them.

Roof Monitors

One of the 1954 developments that will be further explored in 1955 is the design of roof construction that allows for ventilation disposal of heat and smoke in the event of fire. It will probably come as good news to many old-time plant engineers to learn that the roof monitor construction is finding favor again over the more recent flat roof construction. The trend in new plant design may well turn back again to the use of roof monitors, not only because of better ventilation and access in case of fire, but also because of the advantages of more light and air that seem to make for better plant working conditions.

Actual fire tests show that roofing compounds and materials, even those that claim to be fire-resistant, will ignite and burn. The need for a completely non-flammable roofing is urgent. This may be one of the developments to look for in 1955.

Partitions

In a modern plant, the design of the building and the layout of machinery generally makes it impossible to subdivide areas. On the other hand, part of the technique of good fire protection calls for separating the large areas in a plant. The coming year will probably see the commercial introduction of portable prefabricated partitions with specifications that will guarantee 2-3 hours of fire resistance. These partitions can be used to break up large floor areas and thus help localize any outbreak of fire.

Rural Developments

The trend towards rural development and planning of industrial plants in suburban locations emphasizes the importance of an adequate and reliable source of water, with an alternative source in case of failure of the primary supply. As outlying plants continue to be built, more stress will be placed on the development of independent reservoirs from which water at the desired pressure can be drawn in case of a fire emergency and in the event that normal sources are inadequate.

Most plants have set up a local fire brigade made up of operating, maintenance, and supervisory personnel. The importance of these plant brigades is emphasized in a recent survey made among safety directors of nearly 500 large factories showing that 87 percent of the 1,759 fires on their properties during one year were quickly extinguished by trained plant personnel.

In spite of the fine showing of this particular survey, all too often plant fire brigades are not given the opportunity to practice extinguishing real fires, actually operating the protection equipment, or learning to function as a coordinated unit to meet emergencies. Without this training, the men designated for fire brigade service are, in the event of a real threat, less than expert. Proper training and exercising of local plant fire brigades will keynote the progress in this field during 1955.

Substituting Materials

Another trend in fire protection is the idea of substituting materials of non-flammable characteristics for high-flammable materials presently employed in plant operations. For example, research studies are under way to find substitutes for high-flammable cutting, cooling, and lubricating oils; for high-flammable cleaning and detergent fluids; for flammable roofing, flooring, and other construction materials; as well as for packing materials commonly used. As these substitutes are found, they will gradually replace many of the materials that are responsible for plant fire hazards today.

Blaw Knox

New fog fire protection systems installed on utility transformer.

ANNUAL REVIEW AND FORECAST

Materials Handling

Continuous Handling on Integrated Conveyors

IN THEIR EFFORTS to reduce costs, engineers have made much progress towards improving the efficiency of materials flow through their plants. Many recent installations are proving that well-integrated handling systems pay for themselves many times over in reduced labor costs and increased production efficiency.

Bulk Materials

The ability to handle many types of materials, as well as large tonnages, has made belt conveyors the most widely used for bulk materials handling. Their low initial cost, coupled with low operating and maintenance costs, will continue to make them the No. 1 carrier.

Recent improvements have greatly extended the possible applications for belts. Stronger carcass materials provide greater capacities. New belt materials give better resistance against deterioration. Synthetic fabrics, as well as steel wire reinforcing, permit longer belt lengths by increasing the belt's tensile strength and reducing stretch. Improved idler designs protect the belt against wear and reduce friction losses. New structural designs simplify disassembly for moving to new locations.

The problem of bulk materials handling is so complex, however, that no one type of conveyor is suitable for all applications. New designs are constantly being developed, with the result that the plant engineer is finding an increasing number of unusual, but standard, conveyors to solve his materials handling problems.

Specialized Equipment

Among the more recent designs are the vibrating or oscillating conveyors. Both electrical and mechanical types are gaining wide acceptance. These units do more than transport granular, pulverized, lumpy, or solid materials. They can be used for blending, cooling, dewatering, drying, and scalping off oversize material. Combining these functions with their ability to handle hot, abrasive, and corrosive materials, they can be expected to find widespread use for such applications as removing sand from hot castings, handling corrosive chemicals, and recovering coolant from metal chips.

Another unusual design, suitable for heavy abrasives, granular materials, powders, and hot or wet materials, is the tubular conveyor. Looking like an ordinary pipe, its principal advantage is that it can run anywhere a pipe can run, and it requires no more space than piping.

Pneumatic and hydraulic conveyors provide the same advantage, except they do not require a return line. Because they are enclosed and can be used as a continuous unit, they are widely accepted for ash removal in boiler plants. A recently developed pump, operating on the principle of water-jet ejection, is particularly adaptable for hydraulic ash systems since it has no moving parts subject to wear.

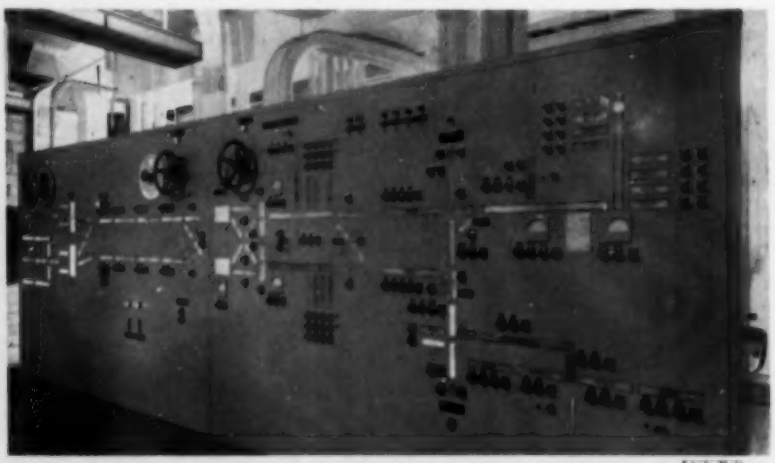
The operating principles of pneumatic conveyors differ according to the pressure and velocity of the air. Differing radically from high velocity systems, for example, is a comparative newcomer that uses extremely low pressure air to fluidize lightweight powdered materials. Low pressure air also is being used for fluidizing to improve the flow of materials through chutes and at the bottom of storage bins.

The recent development of an extremely tough rubber hose can be expected to increase the applications of high velocity air systems where the abrasion of pipe elbows has formerly been a problem. It also will find considerable use as a flexible hose for vacuum unloading systems.

The work horse of bulk materials handling, the belt conveyor, also has seen some rather interesting innovations. The Zipper conveyor, for instance, may be considered to be a

Jay Mfg. Co.

Flexible idlers shape themselves to the load — act as shock absorbers.

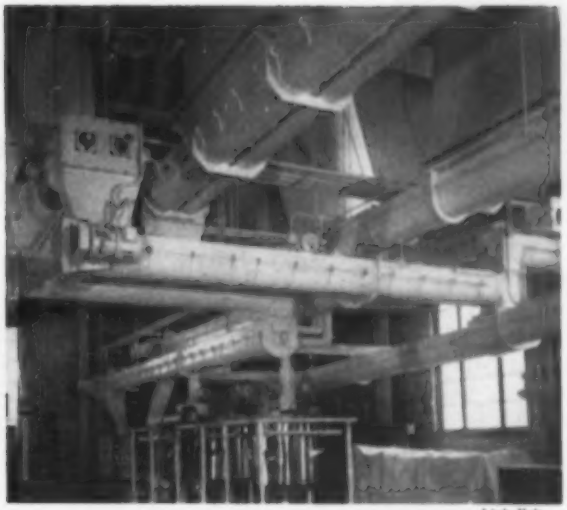


Link-Belt

Main panel provides push-button control of coal handling at Detroit Edison's Conners Creek Station. Miniature diagram indicates operating conditions.

Stephens-Adamson

Zipper conveyor, designed for dusty materials. Having meshing teeth, the belt "zips" closed after loading.



Link-Belt

Maze of screw conveyors in a Chicago bakery provide continuous handling of huge quantities of flour and sugar.

flexible belt with locking zipper teeth on both edges. When closed, it forms a moving rubber tube.

Integration

Accompanying the development of specialized equipment has been a trend towards integration of the individual units into a continuous system. For example, the integration of the many types of conveyors and storage facilities in some of the recently constructed power plants has made it possible for an operator at a control board to regulate the flow of all the coal from the receiving stations to the boilers. At the same time, he controls the flow of ash from the boilers to the loading stations.

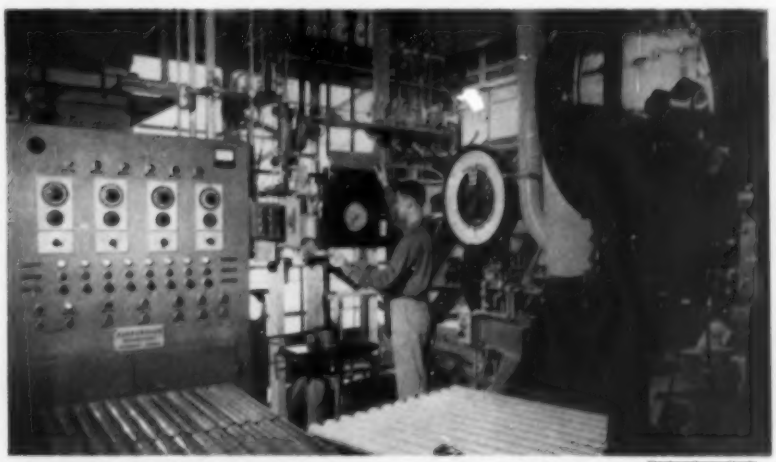
In many types of manufacturing, integration has gone much further. Conveyors and production processes are being made so much a part of one another that it is often impossible to distinguish between materials handling and production. This, of course, is the key to automation.

Proportioning

The most exacting requirements of any bulk materials handling application are encountered in proportioning systems. Completely integrated systems are widely favored, and the trend is toward the increased utilization of instrumentation.

Both continuous and batch systems are widely used. Continuous systems are gaining acceptance wherever extremely large quantities of material must be handled. They provide close control of blending, proportioning, mixing, and the various feeding operations.

Batch systems are finding favor in applications requiring extremely accurate weighing, or where frequent changes of formula are required. They permit almost instantaneous changeover from one formula to another, and they make it possible to inspect ingredients before mixing. Continuous flow of the mixed material can be obtained by using more than one mixer. For those industries requiring constant changes of ingredients, look for a punched card system as a further instrumentation refinement intended to eliminate human errors.

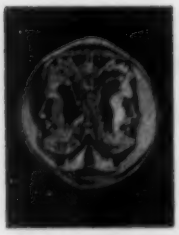


Richardson Scale

Remote control board, a component of a batch-type proportioning system installed in a rubber plant, permits automatic weighing and blending of ingredients.

Stephens-Adamson

Vibrating conveyor shakes sand from hot castings in West Coast foundry.



ANNUAL REVIEW AND FORECAST

Turbines

With Each Step Forward, A New Horizon

TURBINE DEVELOPMENTS, and in particular their contributions to the operating economy of the electrical utility industry were brought into sharp focus during 1954. On the day marking the Diamond Jubilee of Light, The Detroit Edison Company dedicated the fourth unit in their new St. Clair power plant, raising generating capability of utility systems over the 100 million kw mark. Almost simultaneously the Central Maine Power Company was placing the initial units of their new hydroelectric system development at Indian Pond in service. From Thomas A. Edison's Pearl Street Station of less than 75 years ago, the electrical utility industry had grown to a point where generating capability had doubled in the nine years since the end of World War II — and estimates indicated it would redouble within the next ten years.

Most authorities feel past progress will soon seem insignificant in the face of anticipated future growth. Industrial automation, process industries operations, refinement of low-grade ores, manufacture of high-grade metals, lighting, air conditioning, and home appliances will be among the factors contributing to vastly increased power demands. U. S. population is expected to pass 200 million by 1980. Even with a constant labor force, merely obtaining the higher physical output for this increase will require 54 percent more electrical energy.

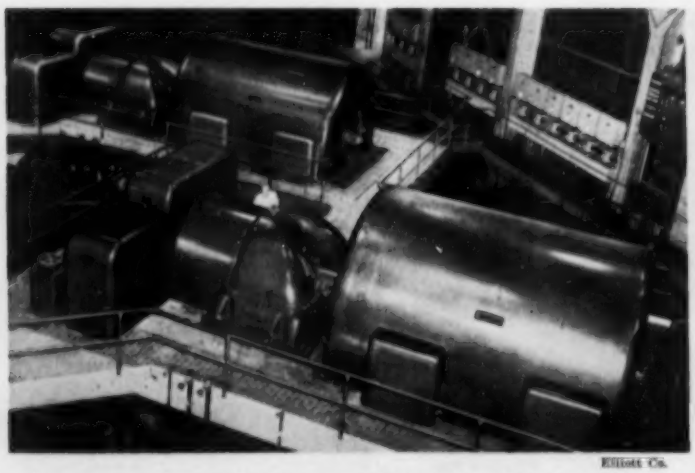
Utility Trends

But utilities will meet the demand despite the fact it will take an investment of 35 billion dollars or more in the next 10 years. During 1954, the world's first close-coupled, cross compound turbine in the Oak Creek Station of the Wisconsin Electric Power Company completed its first full year of operating service and the second was placed in service. Progress continued on the previously announced plans to build units for supercritical steam conditions. The first will be a 125,000 kw unit for the American Gas and Electric Company's Philo Station operating at initial steam conditions of 4500 psig-1150 F with two resuperheats to 1150 psig-1050 F and 185 psig-1000 F. With this unit still in the design-construction stage, the next major advance against the thermal cycle was announced in a decision on the part of Philadelphia Electric Company to install a 275,000-kw tandem-compound turbine for initial steam conditions of 5000 psig-1200 F (initial operation will be at 1150-F). This unit will operate at 3600 rpm, utilize triple-flow exhaust to the condenser, and include two stages of reheat—the first to 1050 psig-1050 F and the second to 250 psig-1050 F. The design is expected to further improve net station heat rates by about 750 Btu per kwh below 1953's best.

Other generating units now on order also show the continuing trend to larger capacities in single machines. Larger units cost less per kilowatt and are inherently more efficient. Probably everything currently being done at 1800 rpm will be duplicated at 3600 rpm when economics dictate the necessity. In December, The Detroit Edison Company ordered the world's largest steam turbine generator for its River Rouge Station. It will be a cross compound reheat unit rated 300,000 kw to operate at initial steam conditions of 2400 psig-1000 F and 1000 F reheat. Industry announces 300,000-kw designs are ready, and 500,000-kw cross compound units are considered practical and could be ordered if needed.

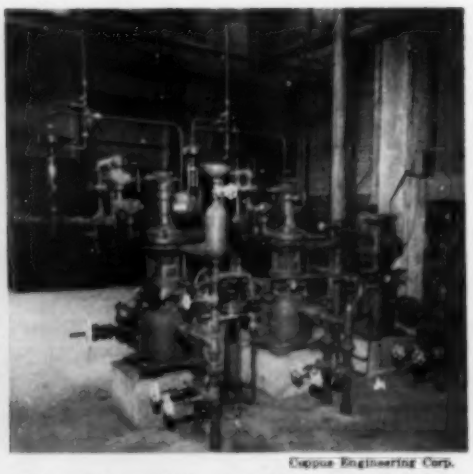
Industrial Trends

While utility developments overshadow the industrial turbine field, they also contribute materially to progress in that area. Most engineers view the industrial turbine field as including units 10,000 kw and smaller, for two general types



Elliott Co.

Photograph shows typical large mechanical drive installation. Units are 11,000-hp turbines driving 100,000-cfm blast furnace compressors.



Cuppus Engineering Corp.

These two vertical steam turbines are used to drive small Ingersoll Rand boiler feed pumps.

American Box Board Co.

Typical by-product power installation includes double extraction-condensing and extraction-noncondensing GE units.

of service: the turbo-generator for producing electrical energy and the direct mechanical drive turbine for driving large pumps, compressors, paper machines, and so forth. Industry is currently purchasing one million kw of capacity a year in these two turbine types with the mechanical drives representing about 45 percent of the dollar volume.

Actually, the importance of mechanical drive turbines is frequently overlooked. These units range from single-stage, 5-hp turbines to 16,000 hp multistage drives for blast furnaces—or even larger units for some special machines—and provide flexible, economical service for many operating conditions. At present, there is a growing demand for mechanical drive turbines, with the trend toward applying the more expensive multistage units in the lower horsepower ratings because their higher efficiency shows up to economic advantage in the face of rising fuel costs and increased value of a pound of steam. High speed units are in particular demand; for example, multistage compressor drives in the horsepower range of 3 to 8000 are operating at 7 to 12,000 rpm.

Industrial Generating Units

Industrial generating units also are following, in a measure, the advances in pressure and temperature being pioneered by the utility field. Some designers feel 1500-psig pressures are reasonable for a 10,000-kw unit, and 900-F machines already are widely accepted. Such steam conditions provide substantially lower steam consumption, often justifying in-plant generation. Where process steam demands are high, by-product power can be generated with an extraction or noncondensing turbine that acts as a reducing valve between the boiler and the process steam header. This arrangement provides the economy required to beat the current, excellent utility service rates.

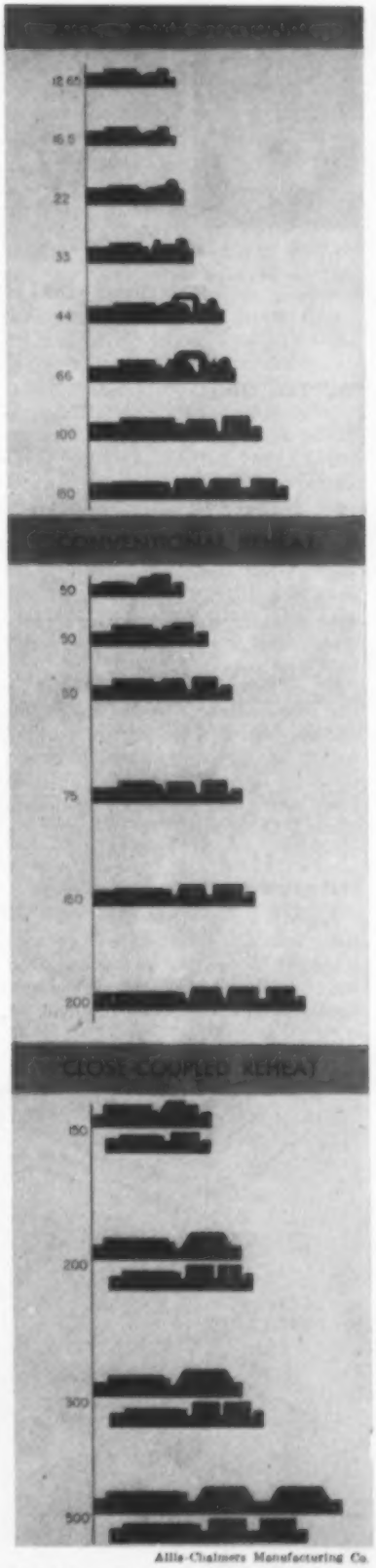
Despite the increasingly severe service conditions turbine engineers are obtaining very satisfactory results with their designs. Ferritic and austenitic materials meet the high pressure-high temperature demands. Blades and blade shanks receive special consideration to avoid dangerous excitation of resonant vibratory frequencies at the high operating speeds. In fact all components, including the governing mechanisms, are very high quality.

Some problems have been introduced by the trend to outdoor installations. For such service, the standard turbine has parts that must be protected from the weather, such as the valve gear on the inlet steam chest and the turning gear motor. Weatherproofing and sealing is required around certain openings in the foundation to prevent water from entering the space under the machine. Some turbine casings now have ledges for attaching weatherproof jackets that extend to and are sealed at the foundation. These features plus the additional cost of erection of an outdoor machine offset part of the cost advantage gained in eliminating some of the building structure. Furthermore, operation, maintenance, and inspection are more complicated.

Gas Turbines

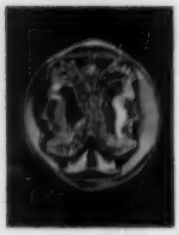
Gas turbine and combined gas turbine and steam turbine cycles also show continuing development. Recently new high temperature resistant alloys of nickel or cobalt-chromium base hardened with molybdenum, tungsten, carbon, titanium, and aluminum have been announced. These materials will be produced for operating temperatures over 1600 F. Other metallurgical advances, effective cooling methods, and improved thermal efficiency will undoubtedly make the gas turbine an excellent prime mover for certain applications.

In the future, wider application of industrial steam turbines can be expected, some reports indicating annual production will double in the next 10 to 15 years. The higher pressures, temperatures, and operating speeds will become more common. Many engineers consider a high speed turbine-gear reducer assembly will be advantageous for driving generators. With the smaller physical size, such assemblies could be fabricated as a unit with the condenser. Advanced initial steam conditions promise to further improve the over-all operating economy.



Allis-Chalmers Manufacturing Co.

Scaled outlines show relative size and appearance of steam turbine generators currently available by capacity rating.



ANNUAL REVIEW AND FORECAST

Water Treatment

Tailored to the Specific Need

BETTER QUALITY water at reasonable cost is in increasing demand as boiler designs advance toward higher temperatures and pressures and as users of process water seek better production control and product quality through elimination of water contaminants. Wide-spread use of air conditioning equipment with its accompanying need for large quantities of properly treated water emphasizes the need for better water at lower cost.

There is no universal rule by which the best treatment procedure can be chosen, so more plants are turning to the professional water consultant for help in analyzing needs. Then plant personnel are being trained in correct procedures for maintaining the water program at peak efficiency.

Pretreatment

Rapid rate pretreatment units of the suspended solids contact (sludge blanket) design are in wide-spread use for clarification, alkalinity reduction, and hardness removal at normal temperatures for many requirements, and for pretreatment of water, when necessary, prior to hot process or ion exchange supplimentary treatment.

In hot process softening, the hot process-hot zeolite system has largely replaced the older two-stage hot lime-soda and phosphate process.

Pretreatment of high-mineral-content water by means of resinous membranes is still on an experimental basis although several ionic membranes are now commercially available. A field unit using this type of process soon will be tested for the U. S. Bureau of Reclamation.

Water Purification

The only commercially practiced processes for approaching complete water purification are distillation and demineralization. Distillation removes nonvolatile, nonionized impurities. Demineralization will not remove completely nonionized substances but it will remove weakly ionized materials such as silicic acid and will also effect a more complete removal of electrolytes than will distillation alone.

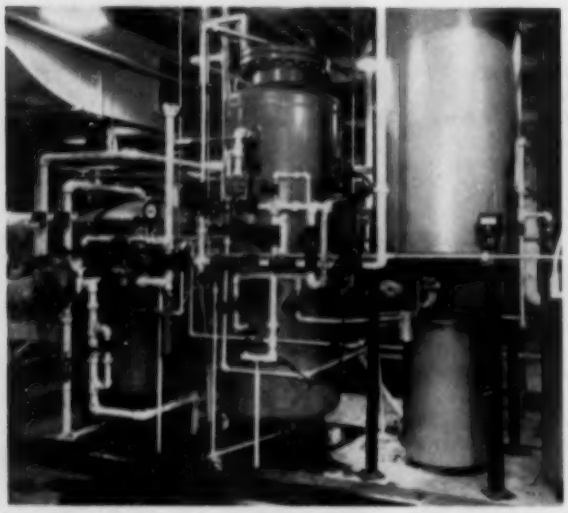
Exchange Resins

Ion exchange resins developed in the last five years eliminate hardness elements, dissolved solids, alkalinity, corrosive elements, CO_2, and silica. Three types of ion exchanger equipment are available: the anion exchanger (either highly or weakly basic); the cation exchanger; and the mixed-bed type. Basic system arrangements now in use are (1) hydrogen cation exchanger followed by weakly basic anion exchanger; (2) the same two units followed by a degasifier for removal of CO_2; (3) hydrogen cation exchanger, degasifier, and a highly basic anion exchanger; and (4) a mixed bed exchanger containing hydrogen cation exchanger and highly basic anion exchanger in one unit.

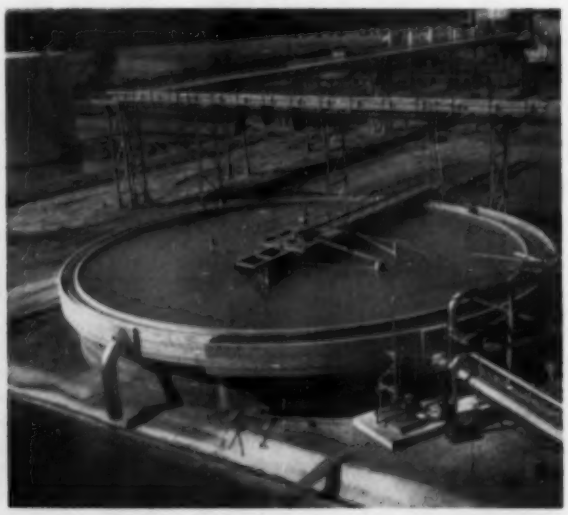
More economical use of both cation and anion exchange resins is expected with the recent development of an electrical device for determining the end of the service cycle. The control can also automatically initiate operation of the regeneration equipment if desired.

Continuous Exchange Units

Continuous ion exchange equipment, only recently available commercially, uses less resin and rinse water than batch or fixed-bed methods. Data gathered from units now in service can be expected to permit development of the equipment to the point where it can have industry-



Elgin zeolite water softener and mixed-bed deionizer treat water for high pressure boilers at power station.



Well water for processing is softened by selective calcium precipitation with Cochrane solids-contact reactor.

The hot process softener pictured is the first stage in a hot lime zeolite system installed by Cochrane.

wide acceptance. However, regenerant costs are still somewhat higher for continuous exchange equipment than for fixed-bed methods.

Since acids and alkalies are used during regeneration and since acid is produced by hydrogen cation exchangers, all tanks and internal parts must be constructed of acid and alkali resistant material or lined with a resistant coating. Many such products are now available, and new materials and improved means of application are expected to keep pace with increased use of ion exchange resins. Large tanks are lined with hard rubber and smaller parts often have spray-applied coatings of the phenolic or vinyl chloride types. Rubber lined control valves, as well as valves of inert plastic such as Plexiglas, Lucite, or Uscolite, are now available.

Boiler Water Treatment

Use of higher temperatures and pressures in steam generating plants has provided much of the impetus in development of better means of boiler water treatment. Evaporators have been replaced by ion exchangers with pretreatment where water conditions necessitate. Pretreatment, which supplies high quality feedwater to the demineralizer, increases resin life and general efficiency of the ion exchanger. Dealkalization of boiler feedwater by the direct anion exchange of alkalinity for chloride anion method of treatment is finding increased acceptance. Trend in high pressure stations is definitely toward use of demineralizers both in new and existing installations.

Corrosion Control

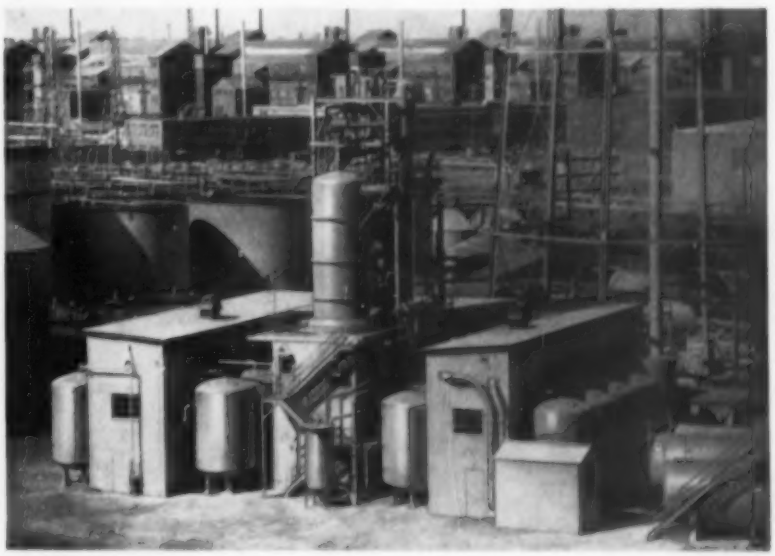
Interest is being shown in means of preventing corrosion in condensate return and boiler feed systems. Sodium sulfite has been widely used to remove traces of oxygen in both low and high pressure steam plants. However, hydrazine hydrate is finding increasing use in high-pressure plants, and its use is expected to increase as more experience is gained in practice. Proper pretreatment, use of filming materials, deaeration of makeup and condensate returns, and use of volatile amines will receive more attention.

Once-through cooling water systems, where the water makes only one pass through the heat exchange system, are now used only where large lakes, rivers, or the ocean offer unlimited cool water. With recirculating systems, sludge blanket precipitation is commonly used for clarification and alkalinity reduction, and sodium zeolite treatment for softening. Excessive alkalinity may be controlled with sulfuric acid and complex phosphates alone or with chromate to inhibit corrosion. Vacuum deaerators are now available in sizes large enough to handle the entire circulating flow where necessary. Catalyzed forms of sodium sulfite, recently developed, react rapidly with oxygen at cool temperatures. Cost of this treatment is rather high since 12½ parts of sulfite are required per one part of oxygen.

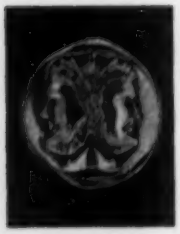
Automatic Operation

More and more interest is apparent in automatic equipment or equipment requiring the least amount of maintenance and supervision particularly where packaged boilers are in use. While all boilers should have clean heat transfer surfaces, package units must have absolutely clean surfaces to maintain design performance. Fully automatic (push-button) arrangements are in operation on some larger ion exchanger installations and even smaller units are being controlled by such devices as hydraulically or pneumatically operated valves. Automatic or semi-automatic operation frees technically trained personnel for other duties and avoids human error. Use of proportioning pumps is increasing for automatically controlled chemical feeding.

More potential users of water conditioning equipment are "shopping around" for better prices and systems that will efficiently solve their particular problems. Most are turning to qualified water consultants for help in designing a program and in maintaining its efficiency. Trends to watch are: further development of continuous ion exchange units; increased use of mixed-bed exchangers; and more manufacturers offering equipment as packaged units.



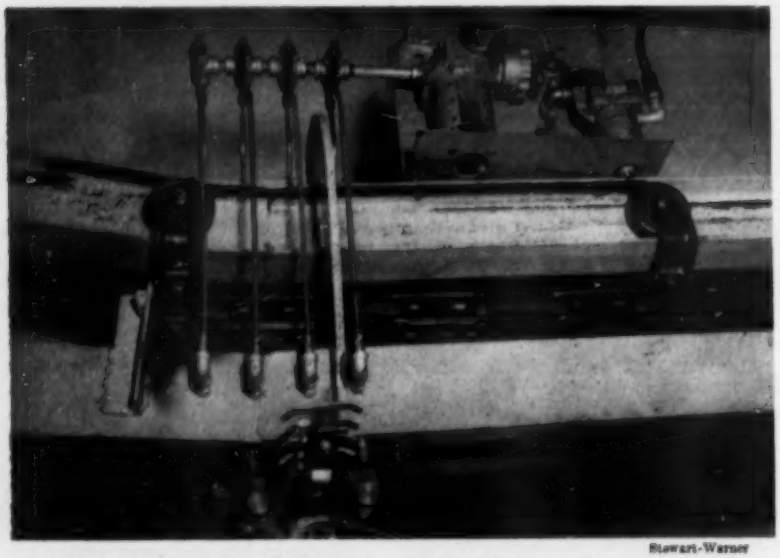
The Permutit demineralization plant shown has, right to left, eight hydrogen cation exchangers, two vacuum deaerators, and eight anion exchangers.



ANNUAL REVIEW AND FORECAST

Lubrication

Chemical Discoveries Mean Better Lubricants



Stewart-Warner

Vaporizing unit efficiently lubricates the carrier of a power-and-free conveyor. Lubricator is in operation only when carrier is in this position.

Clark Bros.

Pressure-feed lubricator provides centralized lubrication for all bearing surfaces of a 350-hp, balanced-opposed compressor. Gages indicate oil pressure.

BY APPROACHING lubrication problems on a more scientific basis, many plants are realizing significant savings in the form of fewer breakdowns and extended life of equipment. Some of the larger industries have even undertaken research aimed at reducing costs by more efficient use of lubricants and lubrication methods.

Also contributing to better lubrication are many improved lubricants. Most of these are the result of advancements in the chemistry of soaps and additives.

Multi-Purpose Greases

Grease bases such as barium and lithium, for example, have resulted in the development of multi-purpose greases. Because of their stability under a wide range of operating conditions, these greases are being used in place of many of the different grades formerly used. Some plants have even been able to use one multi-purpose product for all of their grease applications.

Now being introduced are greases using a non-soap gelling agent such as amorphous silica or hydrous aluminum silicate. They are suitable for operating temperatures approaching 500 F—a temperature which would cause soap base greases to soften and melt. Demonstrating good properties for all-round use, they can be expected to find applications as multi-purpose greases.

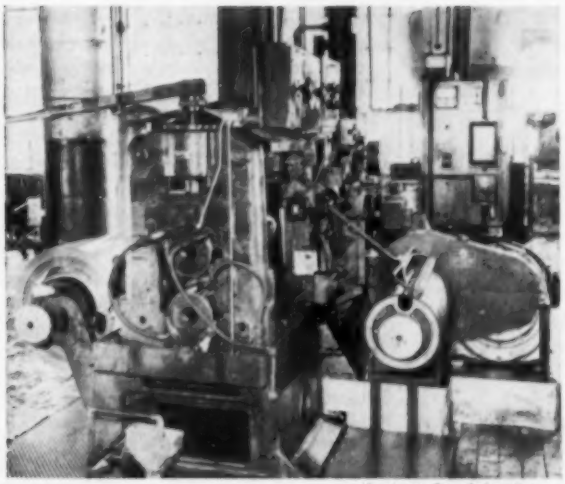
More expensive, but featuring an unusually long operating life at high temperatures, are silicone lubricants. One such product, described as a silicone oil with a non-soap organic thickening agent, has passed tests of well over 500 hours at 450 F, and it can go up to 600 F for short periods.

Industrial Oils

Oil lubricants also have seen much improvement as the result of better additives. So many closed-circulation systems are now tied in with controls, such as hydraulic valves and governors, that oxidation stabilizers, anti-foaming agents, and corrosion inhibitors have become more important than ever before.

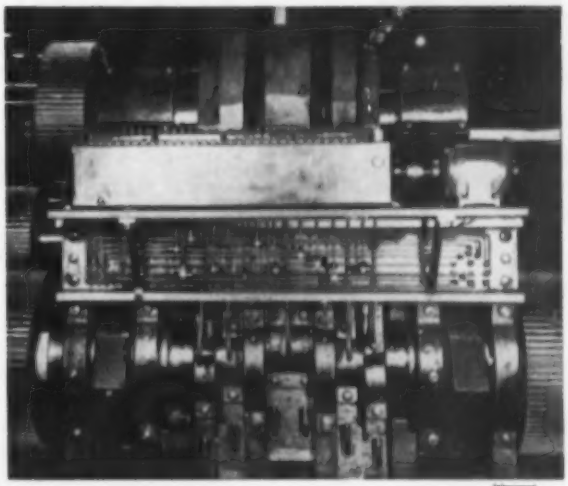
Corrosion inhibitors have been greatly improved. They increase the oil's tendency to oxidize, however. Thus it is usually necessary to use them in combination with oxidation stabilizers. Although adding to the cost, many engineers feel the double protection is justified wherever corrosion is a problem.

Inhibited oils will not, of course, completely replace straight mineral oils. Many applications do not require additives. For example, it



Aluminum Co. of America

Hydrostatic lubrication, applied to aluminum foil rolling mill, reduces power required to start under load.



Manzel

Centralized lubricator with 28 feeders automatically lubricates all bearing surfaces of a crankshaft lathe.

would not be economical to use anything but a straight mineral oil for most once-through systems.

Detergents, long associated with heavy-duty lubricating oils for internal combustion engines, are now finding acceptance for many continuous-use industrial oils, particularly for applications subjected to contamination by extrinsic materials.

Solid Lubricants

Although petroleum products adequately meet most industrial lubrication requirements, they are not suitable for some of the more perplexing problems of extreme pressures and temperatures. These requirements are normally met by dry, solid-film lubricants such as graphite, mica, talc, zinc oxide, and molybdenum disulfide.

In recent years, molybdenum disulfide has received considerable attention. It features exceptional chemical and thermal stability, it does not dissolve in most solvents, and it resists attack from most chemicals. It retains its lubricity from -40 F to 750 F in air, and to 2000 F in an inert atmosphere.

Besides being used as a dry-film lubricant, it is used with petroleum products to supplement lubrication during critical operating periods. It is finding application for gears that operate under severe loads, and it has been tested on diesel cylinder liners as an aid to better break-in.

Centralized Lubrication Systems

Fitting in with the trend towards automation has been an increasing demand for centralized lubrication systems. Applied to serve either individual machines or all equipment in a specified area, they range from manually operated systems to completely automatic, powered units. The lubricant is fed into the distribution lines by any of a number of methods, including timed intervals, cyclic operation, or manually set, one-shot operation. A single pump and distribution system can deliver lubricant under pressure to some bearings while delivering it by gravity to other bearings and by continuous flood to still other bearings and gear trains.

Most of the improvements in centralized lubrication have resulted in increasing the range of possible applications. Of particular interest are recently developed systems using higher pressures to provide better control of lubricant feed, even at the points most distant from the lubricant pump.

Higher pressure units also have been developed for specialized applications. One unit, for example, automatically meters and delivers lubricants to compressor cylinders against pressures as high as 35,000 psi. This system has been developed specifically for the polyethylene chemical field. Other units, good for pressures greater than normal but not as high as that demanded for polyethylene work, have been developed for use in ammonia compressor plants.

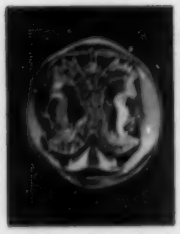
Atomizing Systems

Another lubricating method gaining wide acceptance is the mist or fog type lubricator in which the oil is atomized and distributed to the friction surfaces in a low pressure air stream. It uses less lubricant than other methods, it eliminates overlubrication, and it offers a means of maintaining a suitable oil film in hard-to-get-at places. It also has been used for such applications as stoker lubrication where the constant flow of air serves to carry away the heat and protect the bearing against abrasives and dirt. Atomizing oil lubricators have been used to solve many difficult lubrication problems, and many new applications can be expected.

Hydrostatic Lubrication

A method being given considerable attention for certain specialized applications is hydrostatic lubrication. Using fluid pressure to float a journal on a continuous and moving film of fluid, it does not require relative motion of the bearing surfaces for the formation and maintenance of a lubricating film. Applications have been made to reduce the power required to start equipment under excessively high loads, and to solve problems created by excessive unit loads, particularly in conjunction with slow rotating speeds or reciprocating motions.

Although most of the present hydrostatic applications have been made using such incompressible fluids as petroleum and synthetic oils, both liquids and gases can be used. Air, for example, has been used for many years for lightly loaded, high-speed spindle bearings and for specialty applications such as extremely high-speed centrifuges. A number of papers have been published on the theory and practice of hydrostatic lubrication with air, and applications have been made to show its potential use for extremely high temperature conditions.



ANNUAL REVIEW AND FORECAST

Metals and Welding

New Metals and Improved Techniques

A. O. Smith

Iron powder electrodes increase speed and reduce spattering. Slag curls up.

IRON-POWDER electrodes are considered one of the more important developments in welding in many years. For manual work, principally downhand welding, they increase speed as much as 50 percent as compared to conventional welding rods. They simplify welding operations and permit inexperienced operators to make good welds. Their somewhat higher cost can more than be recovered in savings if the higher speeds and better operating characteristics can be effectively used.

The iron-powder electrodes operate with either a-c or d-c power, but a-c permits higher deposition rates. As their application increases, a general trend towards the a-c welder can be expected.

Hardsurfacing

Of interest to plant engineers is the use of automatic and semi-automatic welding machines for hardsurfacing. Many plants are finding it economical to weld a hard surface to low-carbon steel instead of using expensive alloy steels. Power plants, for example, are refacing pulverizer mill rings and rolls, bulldozer blades, and shovel buckets. One utility reports that hardsurfacing the rings and rolls of their pulverizers has saved them $900 per year for each mill. This plant has 30 pulverizers.

A bare, mild steel consumable electrode and a granular flux to cover the arc are used. The alloying elements are supplied by the flux. The recent development of alloying fluxes have made hardsurfacing with automatic welders less expensive and more effective.

Metals

In the field of new metals, the so-called wonder metals — titanium, zirconium, beryllium, tantalum, germanium, hafnium, and columbium — have received much attention from researchers. Their development has been greatly accelerated by the need for materials of unusual properties in the atomic energy, aircraft jet engine, and guided missile fields.

Although development has been in a few specialized fields, their unusual properties give promise of many applications in industry. The excellent corrosion resistance of zirconium, for instance, makes it especially desirable for piping in petroleum, pharmaceutical, and chemical installations. And zirconium's most interesting property — its low neutron absorption — makes it ideal as a structural material for nuclear reactors. Its future, therefore, is tied closely with that of atomic power.

The major deterrent to widespread industrial use of the wonder metals is their high cost and limited production. Titanium sponge costs about $5 per lb. Zirconium sponge sells for $10 per lb, and milled shapes start at $27 per lb.

Although much publicity has been given them, progress in metallurgy does not end with the wonder metals. United States Steel, for example, recently announced a heat-treated, alloy plate steel with a yield strength of 90,000 psi. The property making this steel so unusual is a high degree of weldability. It eliminates the preheating and postheating required by other high-strength steels after flame cutting or welding.

Its high strength and weldability, combined with unusual toughness even at low temperatures, makes it especially desirable for pressure vessels. A reduction of materials and fabricating time will more than compensate for its increased cost. And it provides added safety because it tears open instead of shattering.

Lincoln Electric

Semi-automatic welders are used to economically reface worn surfaces.

Lincoln Electric

Automatic welding machine being used to hardsurface a mill roll.

HOW NEW SOLNUS OILS HELP MAKE AIR COMPRESSORS FIRE SAFE

Actual photographs show amounts of carbon residue left after dropping equal quantities of Solnus and two other oils on steel plates and baking in a closed oven at 500°F for 24 hours. The three oils all had viscosities of 300 SUS at 100°F.

SEE HOW CLEAN SOLNUS LEAVES HOT METAL

New SOLNUS Oil 0.9%

Typical Naphthenic Oil 5.5%

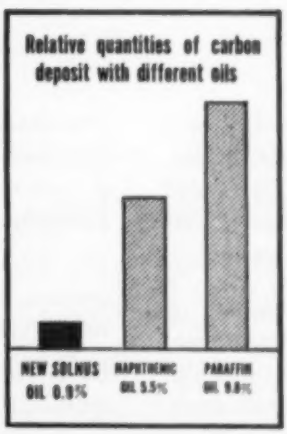
Typical Paraffinic Oil 9.0%

The biggest cause of air compressor fires or explosions is carbon formation on valves and in discharge lines. The best way to avoid these risks is to use the lubricating oil having the lowest tendency to form carbon.

New Solnus Oils have been proved ideal for air compressor use. The minute amounts of carbon that will form are of a fluffy nature; so they blow off quickly and do not build up. Thus the danger of fire or explosion is largely removed.

Solnus Oils have other important advantages, too. Your compressors need cleaning less frequently. This reduces maintenance costs. Shutdowns are less likely. Plant efficiency is increased.

Solnus Oils are also ideal for circulating systems, hydraulic systems, gear boxes, and general lubrication of your industrial equipment. They simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several*. Combine their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price and you see how Solnus Oils give you "more lubrication per dollar."



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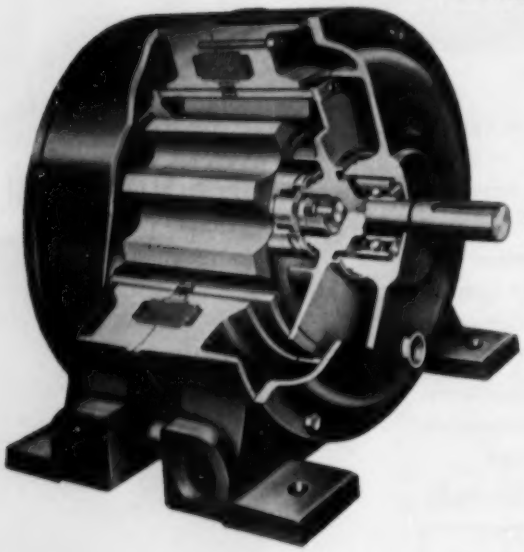
Introducing the New

DYNASPEDE®

Stationary-Field Adjustable Speed Eddy-Current Coupling



★ No brushes, slip rings, or commutator.

★ Completely enclosed; adaptable for operation under hazardous conditions.

★ Wide-range stepless speed control.

★ Reduced maintenance.

Augmenting the well recognized and widely used Dynamatic line of eddy-current couplings, brakes, and drives, the new DYNASPEDE Liquid Cooled Stationary-Field Coupling offers a number of outstanding design and operational advantages.

Principal design features include the mounting of the field section integral with the coupling frame, with the drum-ring rotating concentrically with the field. A toothed rotor (the output member) is mounted concentrically with the drum.

The absence of slip rings and brushes eliminates the possibility of arcing, and adapts DYNASPEDE to hazardous applications in explosive or corrosive atmospheres. Maintenance is materially reduced.

The torque characteristics of the DYNASPEDE coupling are such that with uniform excitation, the torque curve continues to rise with increased slip.

As is the case with all Dynamatic eddy-current couplings, DYNASPEDE provides a very wide range of stepless speed control.

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EATON

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DIVISION EATON MANUFACTURING COMPANY

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Industry and Power

New Products of 1954

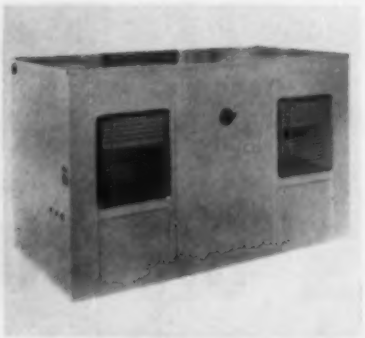
An editorial selection of New Equipment put on the market during the past year

Air Cleaning & Dust Collection
Air Conditioning — Heating, Refrigeration
Boilers & Steam
Building Materials, Maintenance
Compressors and Blowers
Corrosion Control
Diesel and Gas Engines
Electrical Distribution
Electrical Generation
Electric Motors
Industrial Fire Protection
Heat Exchangers
Instruments, Controls
Industrial Lighting
Lubrication
Materials Handling, Storage
Metals & Welding
Piping, Valves, Specialties
Power Transmissions — Mechanical
Pumps
Refractories, Insulation
Turbines
Vibration, Noise Control
Waste Disposal and Water Treatment

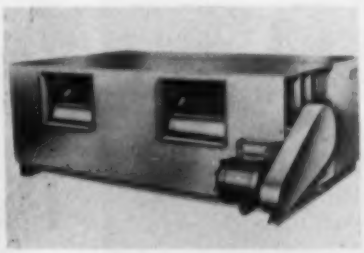
AIR CONDITIONING — HEATING & REFRIGERATION

A50 UNIT HEATERS for steam or hot water operation, offered by American Blower Corp., are built in both horizontal and vertical types in a wide range of sizes for any industrial or commercial application. Known as Venturafin, they operate quietly and are tested and rated in accordance with the Standard Test Codes adopted jointly by the Industrial Unit Heater Association and the American Society of Heating and Ventilating Engineers. The Equitemp Diffuser is standard on all vertical heaters.

A51 RADIANT HEATING glass panels developed by Corning Glass Works are suitable for operation at temperatures as high as 660 F and range in watt densities from 2.6 to more than 9 w per sq in. Long-wave-length flat-body radiation from an area source provides temperature uniformity over large areas with maximum heat absorption. Large radiating area makes possible a high power output while element temperatures remain at a relatively low level reducing the fire hazard. The 13½ in. sq panel is available in 500, 1000, and 1500 w sizes, and the 17½ x 25½ in. panel in 1000, 1500, 2000, 2500, and 3500 w.

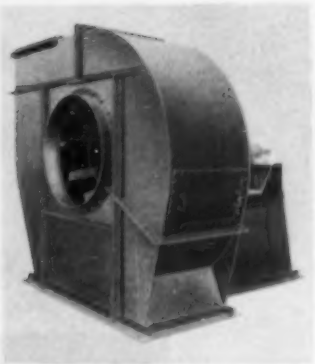


A52 AIR CONDITIONER — For large spaces, from 1400 to 2500 sq ft, the Airtemp waterless air conditioner can be installed indoors or outdoors, near an outside wall or on a roof where an adequate supply of air is available. It provides complete air conditioning directly or through ducts, combined with matching cooling coil or blower units. Airtemp Div., Chrysler Corp.



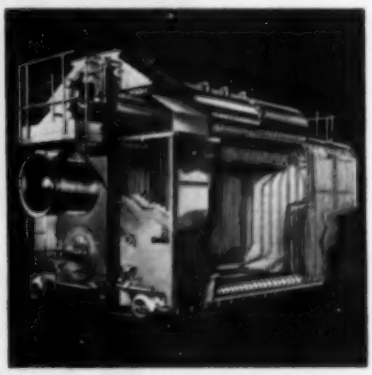
A53 CLIMATE CHANGER — For comfort and process applications, The Trane Co. has introduced the Climate Changer line of remote air handling units in horizontal or vertical models with any one, or all six, phases of air conditioning. The units will heat and cool air, add or remove moisture, filter dust and dirt, and distribute the resulting conditioned air to where it is desired.

A54 INFRARED HEATERS — Heavy-duty infrared generator for high-intensity heating requirements, announced by Edwin L. Wiegand Co., has been especially designed and constructed for web-fed processes in the paper, plastics, and textile industries. Measuring 66 x 12 in., the Chromalox heating panel's output can be easily controlled from 4 to 100 percent of 15 kw capacity, with element temperature up to 1450 F. Standard voltages are 240 and 480 v.



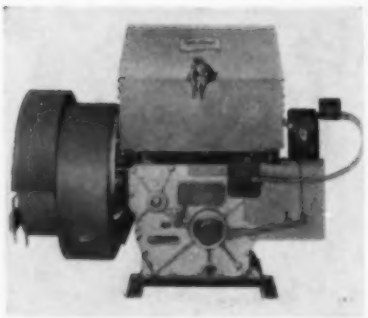
A55 FANS — In sizes 111 through 133, Type XL Fans, developed by Clarage Fan Co., are particularly well adapted to the diversified air and material handling applications because of their in-the-field flexibility. In sizes 137 through 160, high efficiency and adaptability of application are featured. Any standard discharge is obtainable upon order with the 137 and 160 sizes. These fans will handle air or gases at temperatures up to 1000 F, volumes to 130,000 cfm, and pressures to 18 in. static.

BOILERS & STEAM

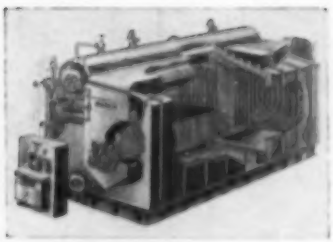


A56 STEAM GENERATORS — Packaged Type MH water tube steam generators can be fitted with components to meet a broad range of needs for power, process, or space heating according to the manufacturer, Union Iron Works. Capacities of standard units range from 10,000 to 40,000 lb of steam per hr and pressures of 250 psi. Furnished for pressurized oil or gas firing, or both, with fully automatic, semi-automatic, or manual combustion controls, the Type MH is also adaptable to stoker conversion. Superheaters, with or without control, can be installed to meet total temperature requirements.

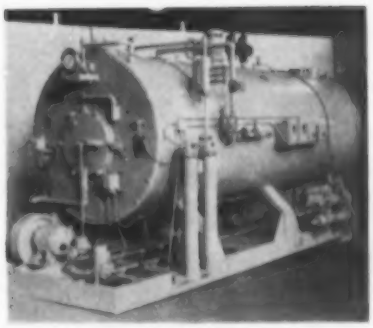
For more information circle number on Reply Card, pages 34/35 & 98/99.



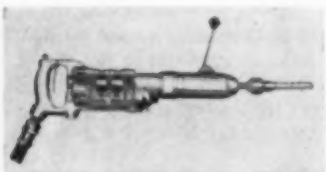
A57 MODULATING STOKERS for commercial, industrial, and institutional coal burning applications perform three separate functions to attain more complete combustion: proportioning of coal feed, air delivery, and draft. The unit also controls the amount of smoke by operating the stoker over longer feeding cycles. Combustioneer Div., The Steel Products Engineering Co.



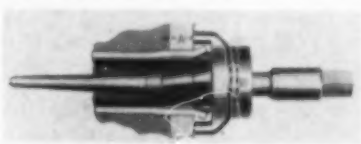
A60 THE TYPE D Superior steam generator introduced by Superior Combustion Industries, Inc. is completely assembled and fire tested at the factory before shipment. Designed for firing with gas, a variety of fuel oils, or both, the water tube units have continuous steam capacities up to 40,000 lb per hr and may be combined in batteries for any required total capacity. The rear-mounted forced draft fan provides an air-cooled furnace roof with the firing front left clear.



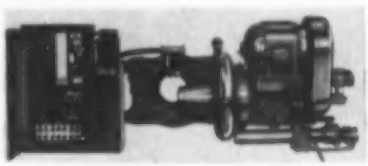
A63 PACKAGED GENERATOR — Built to the same specifications as the Model A line, the Model X offers equivalent horsepower in a smaller physical space and at lower price. The three-pass design has a minimum of four sq ft of heating surface per boiler hp. A product of Ames Iron Works, Inc., it is available in 19 sizes, 15 through 600 hp for pressures 15 to 200 psi.



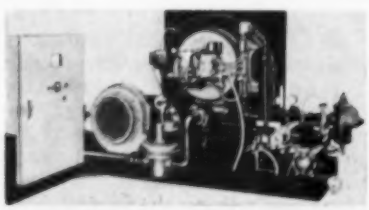
A58 TUBE CUTTER — Removing damaged or faulty small tubes from condensers and heat exchangers can be done easily and quickly with the Internal Tube Cutter, according to the manufacturer, The Airetool Mfg. Co. The cutter is inserted in the tube and quickly cuts the tube behind the tube sheet. Airetool tube removal tools are then used to knock out and remove the remaining portion of the tube.



A61 TUBE EXPANDERS for packaged boilers, developed by the Gustav Wiedeke Co., are available in a complete range of sizes for every requirement. The parallel rolling and flaring type tube expander has a guard which holds the flare roll back while the tube is being rolled and flared into tube sheets. Ball bearings, located between guard and tube expander frame, reduce friction to a minimum.

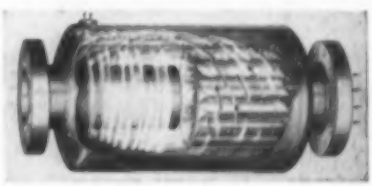


A64 HEAVY OIL BURNER — Design feature of the Preferred Model BHE horizontal rotary heavy oil burner is the Equalizing Valve which improves automatic start on #6 oil, being especially effective in cold starts. The burner is completely factory wired and assembled, compact, and ready for easy installation. Capacities of the ten sizes range from 15 to 175 gph. Preferred Utilities Manufacturing Corp.



A59 PACKAGED BURNERS, for gas, oil, and gas or oil, for commercial-industrial heating and power applications have been developed by Petro Division. Components are integrally mounted on a structural steel base. Gas burners have 3,750,000 to 24,000,000 Btu input; oil burners, 24 to 145 gph.

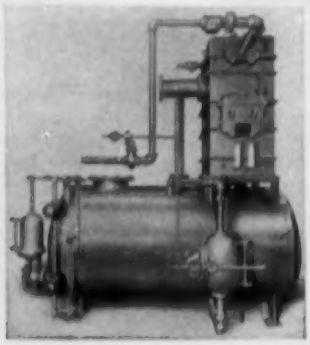
A62 BLOWER — For cleaning extremely wide boilers where the blower nozzle must travel more than 25 ft, Diamond Power Specialty Corp. has announced the Model TT Blower. Among its important features are the rigid truss construction for simple support and step-tapered lance for minimum deflection. An auxiliary carriage supports the feed tube and the drive shaft in the extended position. A single stationary motor mounted at boiler end propels and rotates lance tube.



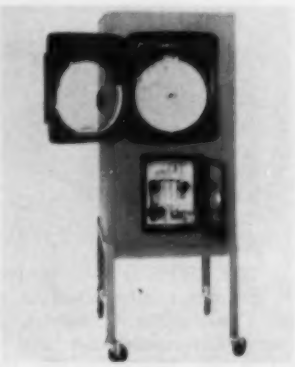
A65 SEPARATORS for use in horizontal steam, air, and gas lines are announced by Wright-Austin Co. Known as the 31-N separator, it is a refinement of the 30-N type separator. It installs in minimum space, occupying little more space than the section of pipe it replaces, is self cleaning, may be used with a wide range of pressures.

For more information circle number on Reply Card, pages 34/35 & 98/99.

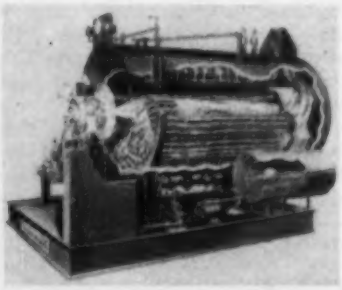
A66 PACKAGED BURNER—Sized for capacities to 42,000 lb steam per hr, the PK-54 burner, manufactured by the Peabody Engineering Corp., is a factory assembled unit combustion system for fully automatic operation. Each unit is engineered to meet a specific combustion problem. Various combinations for standard fuels and controls are available such as for oil only, gas only, oil and gas, and for fully automatic, semi-automatic, or manual operation. Unit can be floor mounted on a concrete base or mounted directly on boiler front at any suitable elevation.



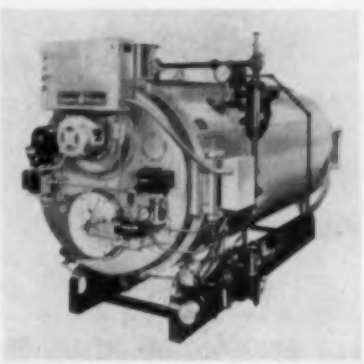
A67 DEAERATORS — Cochrane Corp. has announced a new line of deaerators, completely factory assembled and ready for installation, in a variety of storage tank sizes. Called Uni-Pac deaerators, they are package type units specially designed for small and medium size power plants. Outlet capacities are up to 60,000 lb per hr; storage tank capacities range from 35 to 250 cu ft. They are available in both right and left hand types — the type being determined by location of steam inlet facing tray door. Accessory equipment is available to meet conditions of individual plants.



A68 OXYGEN ANALYZER—To meet the requirements of modern power plants for continuous measurement of dissolved oxygen in boiler feedwater, Arnold O. Beckman, Inc. has developed the Model 2B2B Dissolved Oxygen Analyzer. The unit includes a sample flow regulating and ion exchange unit, an analysis unit, and a modified recorder which may be enclosed in a cabinet mounted on a portable stand or panel mounted if desired. Range is 0 to 20 ppb with an accuracy of 5 percent of the reading. The adjustable range makes it possible to follow the progress in bringing the process back into control after a leak has occurred.

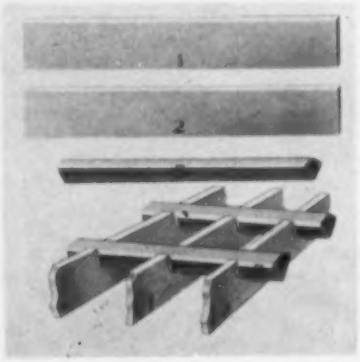


A69 PACKAGED BOILERS—Orr & Sembower, Inc. announces extension of its Model 4 line of Powermaster packaged automatic boilers through 100 hp size. Model designations are 4L for light oil firing, 4G for gas firing, and 4LG for combination gas or oil firing. A three-pass boiler with a single flue gas flow reversal at either end provides maximum convenience to the user for inspection and cleaning thus encouraging "brand new" performance for the entire boiler life. All programming and safety controls are automatic.



A70 PACKAGED BOILERS known as the CB line have been introduced by Cleaver-Brooks Co. for commercial, industrial, and institutional use. Available in units of 15 to 80 hp capacity, the boilers feature quiet operation with low decibel rating; four pass construction guaranteed 80 percent efficient; five sq ft of heating surface per hp; hinged doors for easy maintenance; fuel flexibility; and conversion from one fuel to another in less than one minute. Unit can be used for heating or processing steam or hot water.

BUILDING MATERIALS & MAINTENANCE



A71 WELDED GRATING—Maintenance and painting of grating is no longer a problem when Tri-Forged Welded Gratings are used, according to Dravo Corp., Machinery Div. The one-piece construction with rectangular openings eliminates nuts, bolts, and rivet heads, and reduces the possibility of clogging with dirt or grease. For extremely slippery areas, bearing bars can be supplied with serrated edges. Panels are available in widths up to three feet and length can be as called for up to length in which bearing bar material is available.

For more information circle number on Reply Card, pages 34/35 & 98/99.

A72 CONCRETE SAW — To repair patches of flooring, and for making trenches for electrical conduit, sewage pipes, and water lines, Clipper Manufacturing Co. has developed electric-powered concrete saws in three models — 5, 2, and 1½ hp. The saws give a smooth, clean face which bonds well with replacement material, making a joint that stands up under hard use.

A73 METALSET (A 101), aluminum compound, developed by Smooth-On Mfg. Co., is used for repairing castings, filling joints in sheet metal, and building up surfaces of patterns, molds, and dies. It hardens by polymerization following the addition of a curing agent, and not through evaporation of a solvent. It is hard, tough, and machineable.

A74 FAST-SETTING CEMENT — MW-One, developed by The Philip Carey Mfg. Co. is a protective as well as finishing and insulating cement. One coat application for temperatures up to 1800 F provides a single coat insulation free of cracks and water-resistant after setting time of two to three hours. It comes in two finishes — white for temperatures to 1000 F and gray for temperatures to 1800 F.

A75 SELF LOCKING NUTS — To meet the need for high temperature fasteners in today's industrial processes, Standard Pressed Steel Co. has developed a new line of Flexloc self-locking nuts which resist temperatures up up to 1200 F. Known as series 99F12, they are being made in seven standard sizes with diameters ranging from No. 10 through 9/16 in. They lock in place at any point along the bolt or stud, whether seated or not.

CORROSION CONTROL

A76 TANK COATING — Recommended as a coating for the interiors of all types of tanks to prevent contamination of contents and to protect the interior from corrosion, Emjay Maintenance Engineers has developed a material known as Kolmetal, a mixture of finely pulverized aluminum in a plastic base. The coating is put on in two applications with a four hour drying time between applications. It hardens in the air without the use of heat to a plastic bonded aluminum surface that can be ground, drilled, or bent to a 45 degree angle without chipping. It may also be used as an exterior coating for acid cooling coils.

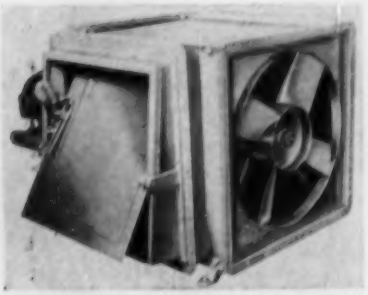
COMPRESSORS & BLOWERS

A77 VANEAXIAL BLOWERS, which may be used to move air at temperatures up to 350 F or air containing acids, alkalies, or fine abrasive dust without fear of premature failure of belts and bearings, have been developed by the Hartzell Propeller Fan Co. A modification of the standard belt-drive vaneaxial blower, these blowers are available in the same range of sizes: 12 to 54 in. Their efficiency and air deliveries are the same as for standard models.

A78 AIR COMPRESSORS known as the PHE line, in the 75 to 100 hp range, are said to approach the efficiency and economy of larger, more powerful, slow speed compressors. Introduced by Ingersoll-Rand Co., they are opposed-cylinder, balanced design driven by direct connected induction motors. Basic design is a two-stage unit for 80 to 125 psi, but other cylinder arrangements are available for higher pressures or for pumping vacuums. Requiring very little floor space, only a simple foundation, and a minimum of piping and connections, the compressor is suitable for factories, foundries, and powerhouses.

A79 AIR COMPRESSORS — The Kellogg Div., American Brake Shoe Co. announces addition of 15 and 20 hp air compressors to its present line. Of V-type construction, these four-cylinder, two-stage compressors are available in 22 different models to cover a wide range of applications. Model B461B, the tank mounted unit illustrated, features pressure switch control for automatic stop-start operation for intermittent use.

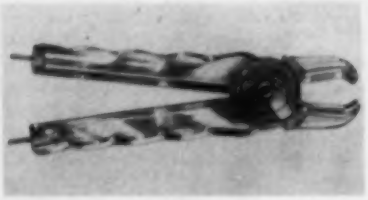
For more information circle number on Reply Card, pages 34/35 & 98/99.



A80 DRAFT INDUCER — L. C. Wing Mfg. Co has redesigned the Wing Furnace Draft Inducer to include interchangeable side panels, moveable mounting feet, motor and fan assembly completely withdrawable, spring-mounted motor and V-belt drive to prevent mis-alignment, variable speed motor, and pre-sealed bearings.

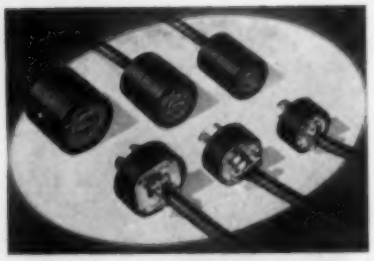
ELECTRICAL DISTRIBUTION

A81 FUSES — Completely coordinated protection of low voltage electrical distribution systems in industrial plants is said to be possible by use of two types of fuses developed by Bussman Manufacturing Co. The fuses, known as the Fusetron dual-element fuse and the Hi-Cap fuse, are designed not only for protection against fault current, but prevent interruptions on the circuit by high but harmless transient current.



A83 FUSE PULLER — Made of Tenite, indestructible hi-dielectric plastic, the Hi Tester and Fuse Puller introduced by Holub Industries, Inc. eliminates the danger of inserting or removing cartridge fuses by hand. It prevents bending of clips through improper removal, and may be used for handling live electrical parts up to 600 v, ac or dc. When testing circuits, the test light glows once on dc and twice on ac.

A84 CONTROL CENTERS — Up to 50 percent in floor space can be saved by use of General Electric Company's new line of motor control centers designed to take nine NEMA size one starter units or six NEMA size two units in the standard 90 in. trough without reduction in pull-box space. Known as DA-7093, the control centers are designed with a new center busing arrangement that increases vertical bus capacity from 300 to 600 amp. Distribution Assemblies Dept.



A86 CONNECTORS — A line of Hart-Lock interlocking receptacles and cord connectors, featuring "No-Trak," non-tracking, non-carbonizing molding material, is announced by Arrow-Hart & Hegeman Electric Co. The molding material will not break down under severe arcing and will withstand flash-over tests of up to 5000 v thus reducing plant maintenance costs.

A87 WIRE MARKERS, self-adhering, that withstand continuous heat to 300 F, intermittent heat to 450 F, and continuous cold to -300 F have been developed by W. H. Brady Co. Known as All-Temperature Wire Markers, they are treated with a silicone plastic over-coating which protects them from dirt, grease, moisture, and abrasion. They are available in two sizes, 1½ in. for wires over ¼ in. OD and ¾ in. markers for small gage wires.

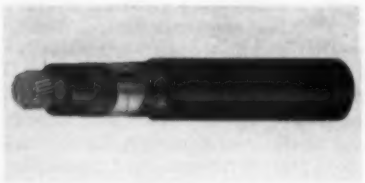
A82 SAFETY SWITCH — Companion to the front operated and raintight switches, the 30 amp side operated safety switch made by Murray Mfg. Co. has strong rotor blade construction which allows for cool operation and double break on each pole. Specially designed built-in arc-snuffers instantly divide and extinguish the arc thus saving wear and extending contact life.

A85 ENCLOSURE — Patterned after JIC requirements, the I-T-E Circuit Breaker Company's NEMA 12 enclosure is said to insure dependable circuit breaker operation in atmospheres containing excessive particles of lint, dirt, sawdust, and other foreign matter. It is available with E, F, J, and L frame circuit breakers in ratings from 15 to 600 amp, 125 to 600 v ac, 125 to 250 v dc. Small Air Circuit Breaker Div.

A88 TRANSFORMERS — Variable transformers to be known as Powerstat types 136 and 236 are available from the Superior Electric Co. in numerous models to meet requirements of individual applications. A standard line of single and three-phase assemblies is provided for manually-operated and motor-driven duty in 120, 240, and 480 v.

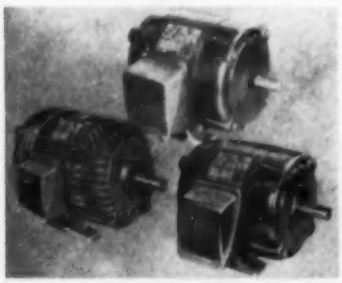
For more information circle number on Reply Card, pages 34/35 & 98/99.

A89 HYDRAULIC OPERATOR mechanism, coupled with a mechanical trip-free linkage, provides improved energy for circuit breakers according to the General Machinery Div. of Allis-Chalmers Manufacturing Co. The five-gal capacity accumulator with a peak capability of 400 hp is said to have an efficiency of more than 99 percent. In a life test consisting of 6000 closing and reclosing operations no changes in operating characteristics, or leakage rate were revealed.

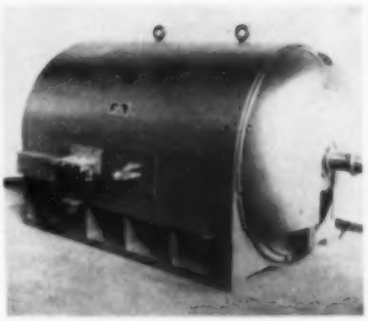


A90 POWER CABLE — Rome Cable Corp. is offering a thermo-plastic jacket as an alternate to conventional Neoprene on shielded power cables. Known as RoSeal, the material is a flame resisting polyethylene sheath applied only over shielded high voltage power cables employing thermosetting insulation such as oil-base RoZone, butyl or RH-RW RoMarine. RoSeal has increased resistance to oil and most chemicals.

ELECTRIC UTILIZATION

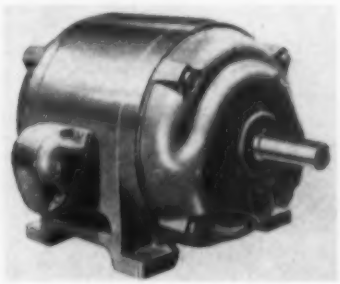


A91 MOTORS — The Life Line-A, designed to offer users longer motor life, greater flexibility in application, and higher reliability as well as decreased size, is announced by Westinghouse Electric Corp. It features improved ventilation, better insulation, a more efficient and better protected bearing, and in addition is quieter and smaller per horsepower, conforming to the new NEMA standard dimensions. It is available in three enclosures.



A92 DRIPPROOF DESIGN for large squirrel cage motors, wound rotor motors, synchronous motors and generators, d-c motors and generators has been announced by Ideal Electric & Mfg. Co. Time required for normal maintenance and cleaning is said to be cut in half and bearing replacement time is cut to 1/10 that of previous models. Design is available for motors 150 to 3000 hp and generators 100 to 2500 kw. Construction permits quick access to the windings.

A93 TRANSISTORS capable of delivering up to five amps of electrical current to a motor have been added to Minneapolis-Honeywell Regulator Company's line of high output transistors. These Super Power units can operate with a maximum collector voltage up to 30 v in a common emitter circuit, or up to 60 v in a common base circuit.



A94 UNICLOSED MOTORS, Type H, announced by U. S. Electrical Motors, Inc., feature completely drip-proof design in the new NEMA 182 and 184 frame sizes. The slot design of the laminations has been improved and the asbestos-protected windings have been reinforced and strengthened by the addition of Mylar laminations. Lubriflush lubrication is provided.

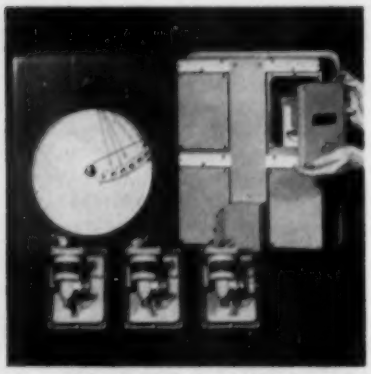
A95 MOTORS — Built to new NEMA standards, the line of squirrel-cage induction motors designed by Reliance Electric and Engineering Co. includes protected and enclosed motors for all industrial purposes. The motors are said to feature greater horsepower in less space and better protection of motor windings, leads, and bearings. Motors up to 30 hp are available in the new NEMA frame sizes. Literature includes a chart giving old and new frame sizes.

INSTRUMENTS & CONTROLS

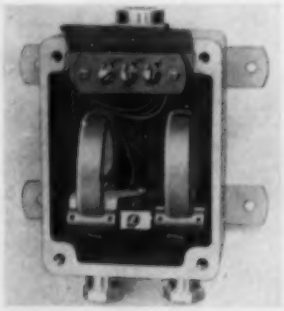
A96 FLOW METER — The magnetic flow meter will measure volume flow rate of any liquid of sufficient conductance and velocity and is unaffected by pressure, viscosity, density, or changes in conductivity of the flowing liquid. Manufactured by the Foxboro Co., the instrument is rated for unlimited maximum flows and is recommended for aqueous solutions, slurries, acids, and other corrosives, in addition to food and drug products.

A97 INFORMATION SYSTEM — To serve as a guide to higher yield in current operations, rather than merely accumulate a historical record, Panellit, Inc. has developed the Panellit Information System which provides complete centralized handling of process information. It automatically logs all process conditions at pre-determined intervals or at any time on demand, and continuously monitors all variables providing an audio-visual signal.

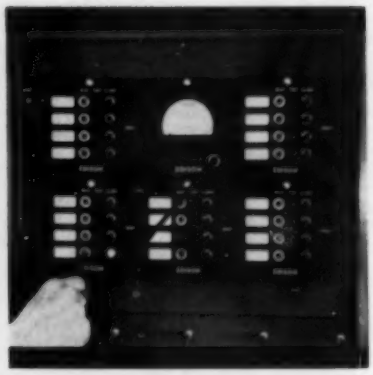
For more information circle number on Reply Card, pages 34/35 & 98/99.



A98 RECORDER — Plug-in, pre-calibrated receivers in the Bailey Recorder make possible continuous, independent records of one to four pneumatic and electric transmissions in any combination, according to the manufacturer, Bailey Meter Co. Receiver units may be added or interchanged permitting easy field adaptation.



A101 PRESSURE SWITCH — available in four classes of proof pressures from 500 to 12,000 psi, Model 532 Meletron Pressure Switch senses a pressure difference between two variable pressures or a variable and a reference pressure. The switch permits opening or closing of a circuit on increasing or decreasing pressure difference from 15 to 10,000 psi at any point within the adjustable range. Barksdale Valves.

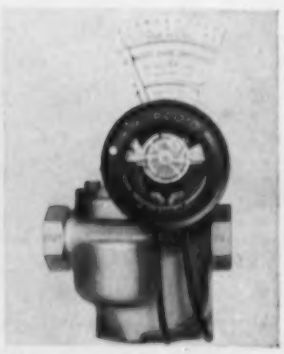


A104 TEMPERATURE monitoring system — To be known as Omniguard, this new system is designed to protect a few or several hundred remotely scattered points from temperature excesses. According to the manufacturer, the Instrument Div., of Thomas A. Edison, Inc., its basic simplicity, building-block design, and low cost bring this type of system within reach of both large and small users. The system is complete whether four points are installed or four hundred points. The Omniguard monitors each point simultaneously without scanning so that no point is left unguarded.

A99 TIME DELAY RELAY — Type F Silic-O-Netic Time Delay Relay, combining the advantages of the hydraulic-magnetic silicone operating principle with the convenience of plug-in construction, is announced by Heinemann Electric Co. Units are for 24 to 220 v ac; 12 to 125 v dc. Contact capacity is 3 amp at 120 v ac or 1 amp at 50 v dc.

A102 WEATHER CONTROL — A combination of an inside control panel and an outside weather head, the Tork Weather Control automatically regulates the heating of any building using automatic gas, oil, or coal heating. Heat is cycled on the panel according to outdoor temperature and indoor needs. The control starts and stops the heating plant at pre-selected intervals as programmed on the 24 hr dial. The unit is available in 115 v, 60 cycle and 208-230 v, 60 cycle models. Tork Clock Co., Inc.

A105 TELEMETERING — Using the time-ratio principle, the TM-15 High Speed Telemetering System has been developed by Controls Corp. to directly telemeter all electrical values with a minimum of maintenance. The receiver can be operated into many styles and types of indicating instruments as well as recorders commonly found on electric utility systems, pipe lines, and water works systems. Transmitting 300 signals per min., it provides fast continuous or selected telemetering of desired values.

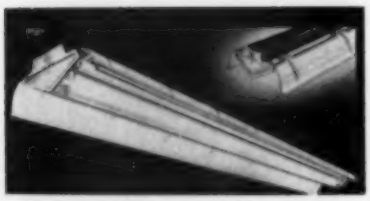


A100 FLOW METER — Development of an improved indicating flow meter has been announced by Henszey Co. Said to provide a more accurate control of free-flowing liquids, the meter has only three moving parts. The completely sealed-in Mercoid switch assures protection from dirt, dust, and corrosion and provides a four-way check by dial, alarm, or light.

A103 MINIATURE INDICATOR — Removable units, easy "one-man" zero adjustment, no parallax, internal illumination, and flush or semi-flush panel mountings are features of the miniature remote indicator announced by The Hays Corp. Indicators can be supplied as electric or pneumatic receivers for measurement of any function such as pressure, draft, or flow.

For more information circle number on Reply Card, pages 34/35 & 98/99.

LIGHTING



A106 INDUSTRIAL LIGHTING—The Lifetime CF-25, a porcelain enameled industrial lighting fixture with 25 percent uplighting, has been announced by DayBrite Lighting Inc. Reflectors are in eight ft lengths. Ribbed construction reinforces lateral strength to prevent reflector from spreading and getting out of alignment. The longitudinal "V" center louver provides 30 deg crosswise shielding and reinforces lengthwise rigidity. The unit can be furnished with or without hinged louver assembly.

LUBRICATION

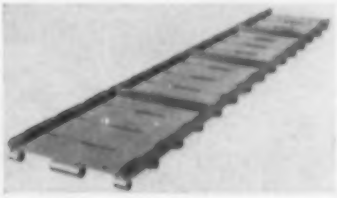
A107 CUTTING OILS—The improved series of Sunicut "W" Cutting Oils contain Sun Oil Company's all-petroleum, polar compound Petrofac. This compound is said to give cutting oils metal-wetting and oiliness properties similar to those obtained with animal and vegetable oils. It cannot turn rancid or support the growth of bacteria that cause skin irritations.

A108 OILERS—Large capacity constant level oilers announced by Trico Fuse Mfg. Co. are designed to feed a complete range of oil from very light to 600 W. Ten ounces, 1 pt, and 1 and 2½ qt reservoirs are available in Lucite plastic or Pyrex glass. The unit can also be used to maintain a constant level of water.

A109 LUBRICATION SYSTEM—Any plant can have the multiple advantages of centralized lubrication with the low-cost install-it-yourself centralized lubrication system known as the Multi-Luber, introduced by Lincoln Engineering Co. It is designed to serve from 5 to 12 bearings on standard inclinable or straight-side punch presses and other similar types of machines. The entire system is contained in a ready-to-install kit and can be installed in about 1½ hr or less, without special tools or engineering skill. The reservoir must be vertical but the body may be mounted in any convenient position.

A110 COOLANT AERATOR—For applying coolants to all manual or automatic machine tools and other industrial equipment, Melard Mfg. Corp. has developed the Mel-O-Flo Coolant Aerator with built-in self-cleaning mechanism. When the coolant supply is turned off, the aerator is automatically purged of chips and sludge, allowing uninterrupted machining. This aerated coolant leaves no vapors. Two models are available, the 600 with 12 in. flexible hose and nozzle and the 601 with nozzle. Both units are furnished with ⅜ in. pipe connectors.

MATERIALS HANDLING & STORAGE



A111 CONVEYORS—An augmented line of piano-hinged apron conveyors in three pan types, four chain pitches, and four basic assemblies, has been designed by Link-Belt Co. to meet a wide variety of conveyor applications. The pans are interlocked at the articulation point to provide a minimum of opening and a smooth joint, and to prevent material from seeping through. The tightness of the hinges reduces tendency to wedge or pinch materials being conveyed.

A112 TABLETOP CHAIN — For applications where flat-top chain having non-metallic links is desirable, Chain Belt Co. has introduced Nylon TableTop chain to supplement steel TableTops. It is recommended for non-abrasive applications and those where hard and jagged edges are absent. The nylon is said to give longer wear, lighter weight, and fits existing tracks.

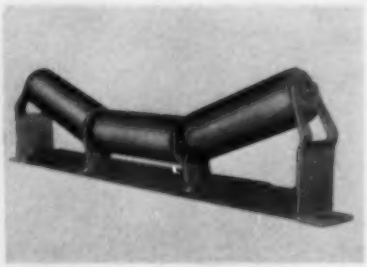
A113 CHAIN CONVEYOR—Lightweight flexible conveyor, known as the No. 460 continuous power chain conveyor, was developed by Richards-Wilcox Mfg. Co. to meet the demand for a simple lightweight unit. Rated capacity is 17 lb per lineal ft or 8½ lb on 6 in. centers. Single drive unit is safety rated at 200 lb draw bar pul..

For more information circle number on Reply Card, pages 34/35 & 98/99.

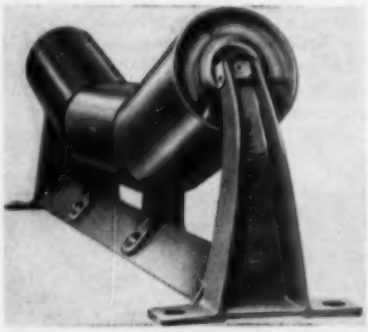
A114 VIBRATING FEEDER—Occupying considerably less space than similar capacity feeders, the Richardson Scale Company's Velofeeder can be adjusted manually or automatically and continuously controlled over a wide operating range. This mechanical vibrating feeder delivers high output with small power use since vibrations occur at near-resonant frequencies. Capacities are up to 50,000 lb per hr on 50 lb per cu ft of material such as grain, or up to 20 cfm. Class 2, Group G explosion-proof motors are available for installations where dust conditions may be a hazard.

A115 HOISTS—American Engineering Co. has announced the Class BB Lo-Hed electric hoist with welded steel chassis in two and three ton capacities. This hoist features heat treated alloy steel, straight line, three-reduction spur gears; automatic Weston heavy duty type lowering brake; heavy duty hoist and crane type motor; single speed pushbutton control, and completely shrouded, all-steel safety type bottom block, ball-bearing sheaves, hook carried on anti-friction thrust bearings.

A116 POLY-V-BELT, single, endless rubber belt with series of paralleled V ribs molded lengthwise around the inside circumference and an uninterrupted, high-strength member of synthetic cords across its entire width has been introduced by Manhattan Rubber Div. of Raybestos-Manhattan, Inc. Sheave grooves are designed to mate precisely with the belt ribs, and since the belt covers the full width of the drive member, the load is distributed equally over the driving surface.



A117 BELT CARRIER—Low-cost belt conveyor carrier introduced by Stephens-Adamson Mfg. Co. features carrier rolls which are interchangeable and can be inserted or removed from brackets without tools. Four inch diameter rollers have spun ends and turn on precision ball bearings. Alemite fittings are provided for relubrication if desired, although sufficient grease is contained to operate on a "lubricated for life" basis.



A118 BELT IDLERS—The Jeffrey Mfg. Co. has announced MD and HD Series Belt Idlers with the new Duoflex Seal. The seal is said to keep out dirt and retain the grease for practically an endless period of time. The idler is factory packed, adjusted, and sealed.

A119 CAR SHAKERS—National Conveyor & Supply Co has designed the Model D to save you time, labor, and money. The car shaker features the improved Quick-Attach unit and integrally mounted self-aligning sealed double row roller bearings. Field replacement is said to be considerably simplified. Three basic types of installation can be used: job crane, wheel cart, or mono rail depending on whether unloading is done in one spot, on two or more tracks, or from several cars.

A120 FEEDERS—Periphery sealed rotary feeders introduced by Beaumont Birch Co. will handle an infinite variety of bulk materials, including explosive starches and powders. To prevent leakage, and for maximum protection of material being handled, the entire periphery of both rotary ends feature spring-loaded seals. The seals may be Teflon, Neoprene, asbestos, or rawhide, depending upon the temperature and material being handled. Only four bolts must be removed from end of casing for maintenance. The feeder is available in 4, 6, 8, 10, and 12 in.

A121 ELECTRIC HOISTS—Lightweight, push button controlled electric hoists of the wire rope and drum type have been announced by Shaw-Box Crane & Hoist Div. of Manning, Maxwell & Moore, Inc. Known as Series 600 Load Lifter Hoists, they are available with lug, upper hook, and trolley suspensions in capacities of 1000 and 2000 lb. Features include frame made from aluminum alloy, double brakes, and interchangeable suspension and positive upper stop to prevent overtravel of hoist hook.

A122 FLY ASH HANDLING—United Conveyor Corp. has developed the Nuvaflow Fluidizer which slowly introduces low pressure air in the bottom of the ash storage bin, liquidizing the entire base of the ash pile so that ash flows freely and uniformly into the unloading equipment. The unit has been designed to prevent the ash from arching over the discharge outlet and from forming a small diameter funnel within the bin. Because the fluidizer keeps ash moving, live capacity is increased.

For more information circle number on Reply Card, pages 34/35 & 98/99.

A123 FLOAT TRAP — With a float mechanism, the 50 Series float trap, manufactured by Hoffman Specialty Mfg. Corp., is for removing condensate only when no air problem is involved. In addition to the float mechanism, the 50 Series float and thermostatic trap has a thermostatic element, pin, and seat so that the trap and connecting piping cannot become air bound. The thermostat assembly is factory set.

A126 RESEATER TOOLS — Both two inch and three inch size Skinner-Seal Valve and Bibb Reseater tools are available in kit form from M. B. Skinner Co. The 2 in. size is for ½ to 2 in. valves and ¼ to ¾ in. bibbs, and the 3 in. size for ½ to 3 in. valves and ¼ to ¾ in. bibbs. The kit provides a full range of guide pilots, cutters, spindles, tapered bushings, plus a hand wheel and bitt brace.

A129 PLUG TYPE VALVES for pneumatic applications, fluid transmission systems, instrumentation, and similar uses have been developed by The Imperial Brass Mfg. Co. The valve features a pressure balanced plug and is recommended for working pressures to 300 psi. Two different styles are offered — male to female, and male to male pipe thread — in three different pipe thread sizes, ⅛, ¼, ⅜.

A124 PRESSURE JOINT — Johnson Corporation's redesigned Type J Rotary Pressure Joint is available with a special assembly plate which serves to hold the internal parts of the joint in position when the head is removed. The syphon pipe can be removed without disturbing the joint proper or the steam inlet connection. All Type J Joints, one inch and larger, are designed so plates can be added.

A127 NON-SEIZING VALVES — Republic Mfg. Company's Lo-Temp Valves are said to be smooth turning in any service or at any temperature within their range. With a plug made of Teflon, no lubricant is needed to prevent seizing: the valve is leakproof. The plug is unaffected by acids, alkalies, or gases.

A130 STOP VALVE — An excess-speed safety stop valve has been developed by Coppus Engineering Corp. for its line of steam turbines. This improved stop valve functions entirely independently of the constant speed governor and eliminates the usual levers between safety trip mechanism and shut-off valve. The valve stem no longer protrudes outside the valve body, a new feature that prevents stickiness.

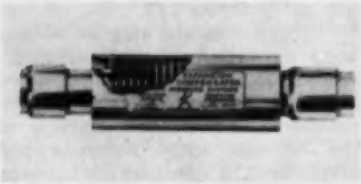
A125 CONTROL VALVES — Added to the line of high pressure control valves manufactured by The Annin Co. is the Series 34 line for pressures to 6000 psi and temperatures to 900 F. Pictured are models 3460, Domotor operated, and 3420, cylinder operated valves. Also available is model 34, manually operated. Sizes are ½ and ¾ in., in both offset globe and angle bodies.

A128 VALVES — The 2000 psi capacity WP Mudwonder alloy steel mudline valves, introduced by Edward Valves, Inc., offer many advantages for any type of abrasive fluid service. They are said to cut down-time, disassemble and assemble easily, keep piping hook-up fixed throughout drilling operation, seal drop-tight, operate easily and quickly, stop sanding or settling of solids in valve, give longer service, and reduce maintenance costs and labor.

A131 STRAINER TRAP — Armstrong Machine Works has added to its line of integral strainer steam traps a new larger model designated as No. 882. It is said to cost less than a standard trap plus separate Y-type strainer, and fewer fittings are required to install it. It is recommended for use where dirt and scale conditions are a problem. Top operating pressure is 250 psig.

For more information circle number on Reply Card, pages 34/35 & 98/99.

A132 STEAM TRACED PIPE—Piping users who handle sluggish chemicals or tricky solutions have a solution to their equipment problems in Unitrace, an integrally extruded steam traced aluminum pipe manufactured by Aluminum Company of America. Preformed insulation will fit Unitrace. It is available in standard 2 in. pipe size without die charge.



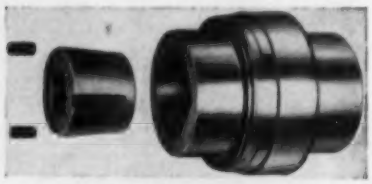
A133 EXPANSION compensators for hot water and steam heating systems that require no maintenance or adjustment have been developed by Flexonics Corp. The units may be installed in low pressure steam or hot water lines carrying pressures from 40 to 60 psi up to 250 F. Diameters of ¾, 1, 1¼, and 2 in. are available. One compensator will absorb expansion of 30 ft of copper tube or 50 ft of steel pipe in hot water installations with ½ in. compression stroke.

NOISE CONTROL

A134 NOISE CONTROL — The long standing need for an instrument that effectively extracts all of the water from water-sealed vacuum pump exhausts, and simultaneously reduces noise of gas discharge to ear-comfort level has been met with the Water Separator Snubber, introduced by Burgess-Manning Co. The combination units range from 6 to 26 in. in dia and handle from 60 to 4700 cu ft per min.

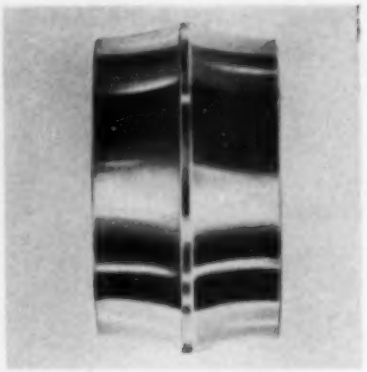
POWER TRANSMISSIONS — MECHANICAL

A135 SPEED REDUCERS—in the range from 1 to 1950 hp, the expanded lines of Herringbone gear speed reducers announced by W. A. Jones Foundry & Machine Co. offers more standard size drives and more standard ratios for every size to enable the user to select a unit that will more exactly meet his requirements. Sixty standard ratios ranging from 1.27 to 1 up to 355.8 to 1 are available in types suitable for coupled or overhung load applications. Nine standard shaft extension assemblies and two standard styles of bed plates can be provided.



A136 TYPE C COUPLINGS, in three sizes adapted for use with Dodge Taper-Lock Bushings, are announced by Lovejoy Flexible Coupling Co. Sizes are: C-191 (Dodge Bushing No. 2012) for bores ½ to 2 in.; C-226 and C-276 (Dodge Bushing No. 2517) for ½ to 2½ in.

A137 CLUTCH COUPLING—The Twiflex Automatic Centrifugal Clutch Coupling, said to have exceptional ability to handle all types of misalignment, is made in a large number of sizes and several different types. It improves starting conditions and provides smooth acceleration on drives for high inertia equipment and prevents excessive torque transmission during starting of machinery. The Hilliard Corp.



A138 ROLLER BEARINGS — Increased anti-friction bearing capacity of from 25 to 50 percent, and service life 2 to 2½ times longer than formerly possible, is obtained with C type spherical roller bearings, according to the manufacturer SKF Industries, Inc. The bearing is available in series 222 and 223. Inner race of the bearing is designed without undercuts or integral flanges.

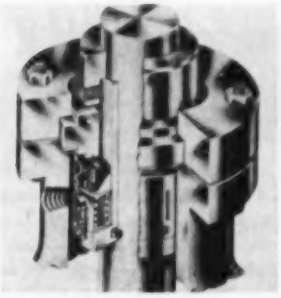
PUMPS

A139 MOLDED OIL SEALS known as the LPD Clipper Seal line have been designed by Johns-Manville Corp. for minimum seal wear, low frictional heat, and less drag (reduced torque) on the shaft. The narrow lip bearing area reduces the need for lubrication in proportion to its surface. The relationship between the lip area and the hinge area stays proportionately the same throughout the range of flange widths and shaft sizes.

A140 ROD PACKINGS—Two new mechanical rod packings developed by the Mechanical Packing Div. of the Flexrock Co. use an entirely new lubricant and impregnation process for handling non-water soluble solvents such as benzene, carbon tetrachloride, and Stoddard solvents. They are said to be less expensive than other packings offered for the same service because they give better and longer service.

For more information circle number on Reply Card, pages 34/35 & 98/99.

A141 RUBBER PUMP—The ECO synthetic rubber pump, designed by Eco Engineering Co., is now available with Hastelloy-B or Hastelloy-C shaft, eccentrics, and guides. Hastelloy-B permits the handling of boiling hydrochloric, sulphuric, and mixed acids. Hastelloy-C extends pump service to highly oxidizing acids and such oxidizing agents as free chlorine and bleaching compounds. For sustained service, capacities are up to 10 gpm and pressures are up to 100 psi.

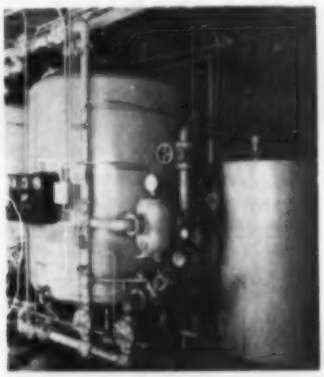


A142 SHAFT SEAL—Crane Packing Company's mechanical shaft seal Type 9 is mounted on a sleeve with an outside clamping ring. This permits quick installation or removal in practically all modern split-case pumps. The seal can be used to handle most corrosive liquids at temperatures to 500 F.

A143 SUMP PUMP—For portable or stationary service, Penberthy Injector Company's automatic electric submersible sump pump with 1¼ in. discharge has a capacity of 2200 gals per hr at a discharge head of 10 ft. It pumps 400 gals per hr at 24 ft head. Operating on continuous or intermittent duty, the pump features positive priming without venting.

A144 BOOSTER PUMP—As a mechanical vacuum booster pump, Model MB is specially designed to exhaust into the inlet of a single stage pump acting as a second stage or backing pump. No sealing fluid is required so that the booster acts as a positive displacement compressor to retard backstreaming of oil vapors into the vacuum system. Made by the Kinney Mfg. Div. of New York Air Brake Co., the unit has a very broad pumping speed versus pressure range.

WATER TREATMENT

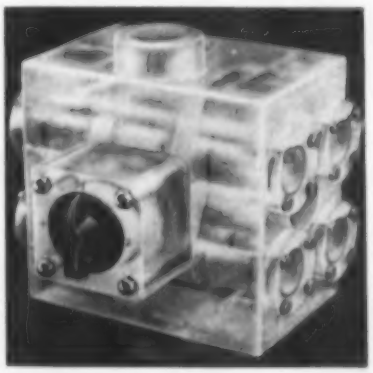


A145 AUTOMATIC ZEOLITE water softeners which feature independent adjustment and control of each step in the regeneration cycle have been introduced by Elgin-Refinite Div. of Elgin Softener Corp. Design of the unit makes it possible to regulate duration and flow rate of each step—backwashing, brining, and rinsing—to fit operating requirements and type of zeolite employed. Regeneration cycle is started by one of three methods: meter contact when specified amount of soft water has been delivered, time clock, or pushbutton.

A146 CHLORINATORS — Incorporating the latest developments of practical chlorinator design, the A-703 introduced by Wallace & Tiernan Inc. features such improvements as dual orifice meter which allows feed ranges up to 100 to 1; corrosion resistant materials wherever structural design permits; and linear scale reading of chlorine flow rate. Maximum capacity is 1000 lb per 24 hr. The pedestal is heavy Fiberglas and the glass-enclosed visible-vacuum and water-diaphragm feed control has been improved.

A147 HYDRO-SOFTENERS—For the continuous softening of process water containing 200 ppm or less total hardness, the Dorr Co. has announced the Dorrco Hydro-Softener which will produce an effluent containing less than 5 ppm hardness suitable for boiler feedwater. Softening is achieved through the medium of base exchange resin, a portion of which is continually regenerated with brine in a separate column, thus eliminating the usual batch operation.

A148 INLET DIFFUSERS, for efficient operation of cation and anion exchangers and to prevent windrowing and shifting of exchange resin bed, have been developed by Permutit Co. For hydrogen exchangers, these cylindrical devices are fabricated from an inert plastic; for the sodium cation exchangers the diffusers are of perforated metal.



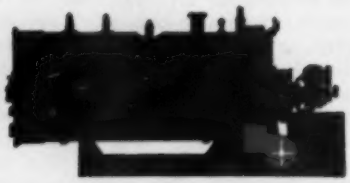
A149 CONTROL VALVE—The Cycloflow Single Control Valve introduced by American Water Softener Co. permits the plant operator to manually accomplish regeneration of an ion exchange unit by manipulation of a single knob. Available in acrylic plastic or cast iron depending on application.

For more information circle number on Reply Card, pages 34/35 & 98/99.

HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS

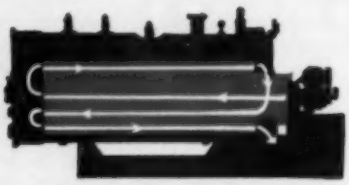
A COMPLETE PACKAGE

Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.



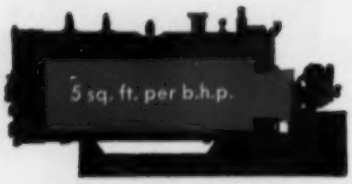
INDUCED DRAFT THAT'S BUILT-IN

... eliminates need of an expensive chimney ... Multiple fans draw evenly on all tubes, reducing maintenance.



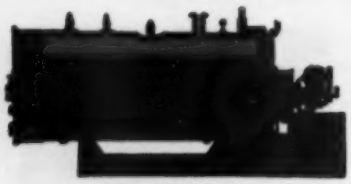
4-PASS, DOWN-DRAFT DESIGN

High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.



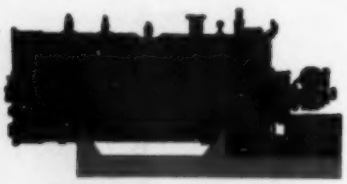
AMPLE HEATING SURFACE

A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.



RESERVE CAPACITY

Greater steam space and large evaporating surface provide ample reserve capacity & better than 99% dry steam.

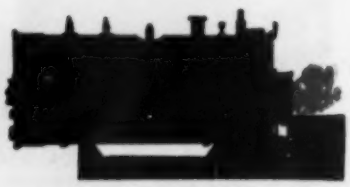


NO EXPENSIVE FOUNDATION

Built on a rigid channel iron base, a Superior Steam Generator needs only a floor capable of supporting its weight.

BUILT-IN CONTROLS

All controls essential to completely automatic operation are factory-wired to an easily accessible control panel.



BURN OIL, GAS, OR BOTH

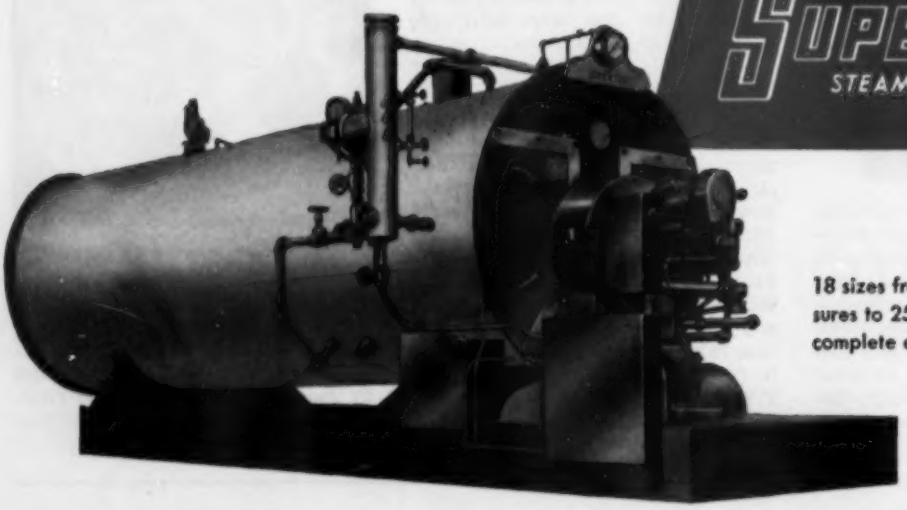
Superior Burners burn oil or gas or a combination of both ... changing from one fuel to the other in seconds.

Superior Steam Generators are the ideal choice for a new steam plant ... the simplest answer to expanding your present plant ... the easiest solution to replacing obsolete boilers.

Guaranteed to develop maximum rated capacities at thermal efficiencies in excess of 80%, their design embodies features which insure long-lived dependability and maximum fuel economy.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 702.

SUPERIOR COMBUSTION INDUSTRIES INC. **TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.**

Circle 537 on Reply Card for more data

readers' guide

. . . an index to advertised products

The table below lists, according to product groupings, all equipment advertised in this issue. To request more data, circle key numbers on Reply Cards, pages 34/35 & 98/99

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ideas in action

. . . in U. S. industrial plants

Transformer in Service Since 1902 Wins G-E's Treasure Hunt

The Power Transformer Department of General Electric Co. last August offered to replace the oldest medium-size G-E transformer still in operation with a modern transformer manufactured at the new Rome, Ga. Medium Transformer Plant.

Of the 209 old transformers on which data were received, the oldest is a 53 yr old unit shipped in January, 1902 by Stanley Electric Co. (which eventually became a part of G. E.) to the West Coast. It was purchased by California Gas & Electric Co., one of the companies that formed the present Pacific Gas & Electric Co.

The old unit was rated in kilowatts (as all were at the time) and had a capacity of 1100 kw, a high voltage rating of 30,800 and a 2566 low voltage winding. A modern transformer of the same physical size could handle about four times this amount of power.

The PG&E transformer was first installed at First and Grove Streets in Oakland, Calif., then moved to

Harold T. Sutcliffe, PG&E general superintendent of substations, shows oldest operating G-E transformer.

Napa, Calif. in 1910. In 1915 it was moved to its present site at Davenport where it is one of a bank of seven G-E units supplying electricity to the Santa Cruz Portland Cement Co.

Present plans of PG&E call for retirement of the unit and the six others at the Davenport substation next year. The substation has been carrying loads of 6000 to 7000 kva and next year the utility plans to build a new substation for carrying approximately 10,000 kva.

Another 1902 transformer owned by PG&E was burned out as a result of the San Francisco earthquake and was rewound, put back into operation, and still is in operation today.

Seven 1902 transformers of the Connecticut Light and Power Co., rated 850 kw, were in continuous service at its Bulls Bridge Plant at New Milford, Conn. until 1949 when they were rewound in connection with raising of system voltage there, then put back in service.

A 1908 transformer of the Metropolitan Edison Co., rated 1400 kva, is still transforming power from generators operated by water wheel turbines placed in service in 1904 in the Susquehanna River in Pa. Two 850 kva transformers, built in 1902 and installed in 1904, are located a few miles up-river from the generating station to step down power to utilizing voltage.

Though utilities in foreign countries were not included in the "Treasure Hunt," a Mexican utility notified G. E. that it had two 1903 transformers that are still in service.

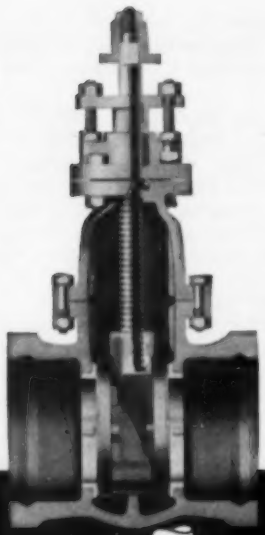
The PG&E 1902 unit will be shipped to Rome, Ga. where it will be set up outside General Electric's new Medium Transformer Plant as a monument to the strides made by the nation's electric utilities and electric equipment manufacturers in advancing the science of distributing electric energy, and to the part that standardization of apparatus has played in this progress.

Dew Point Control Cuts Boiler Tube Deposits

The build-up of "fireside" deposits on boiler tubes in stoker-fired coal furnaces has been a common problem in all high capacity steam generators. Not only is the operating efficiency of the furnace materially reduced by the build-up of these deposits on the heating surfaces, but the availability of the furnace itself is greatly decreased, due to the necessity of frequent shutdown for cleaning and repair. Studies undertaken in 1949 at the Delray Station of Detroit Edison Co. revealed a close relationship between the humidity of the combustion air, varying from season to season, and the rate at which the deposits accumulated. Subsequent tests established that by controlling the humidity of the entering combustion air, the rate of deposit build-up could be substantially decreased. Frequency of shutdown for cleaning and other maintenance was correspondingly reduced, with a like improvement in furnace availability.

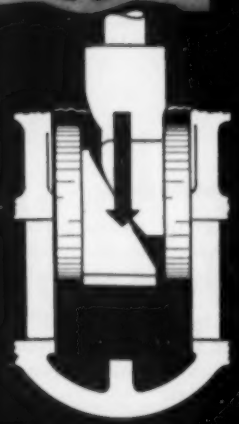
As a result of this experience, Detroit Edison has installed humidification control systems on all stoker-fired furnaces at its Delray Station.

The system is controlled by a single instrument, a Foxboro Dynalog Stabilog Controller. Moisture content of air from preheaters is measured by a Foxboro Dewcel element which senses the dew point of a continuous sample of air piped to a sampling chamber. The controller receives this dew point measurement, records it on a circular chart, and automatically operates a valve to control flow in the water admission line.

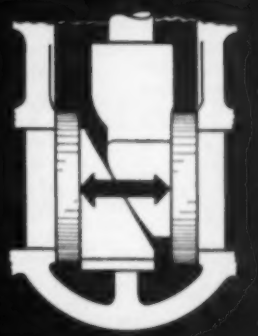


Look how you gain LONGER, TROUBLE-FREE VALVE LIFE

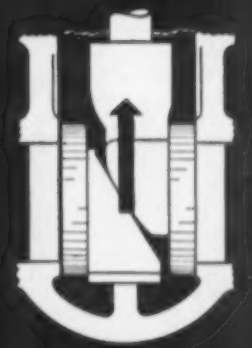
with Darling revolving disc gate valves*



DESCENDING. Fully revolving discs, independently hung, change seating position at each closing, assuring uniform wear distribution for prolonged service. Plain "no pocket" discs are interchangeable for *extra* life!



CLOSED. Faces of upper wedge are radiused and faces of both wedges are transversely beveled for equalized wedging pressure and *tight closing despite valve body distortion.*



RISING. Wedging pressure on both discs is released before discs start to rise. Complete absence of wedging pressure during travel of discs assures easy operation, tight closing and greatly prolonged valve life!

***DARLING REVOLVING DISC GATE VALVES FOR EVERY NEED.**

These unique Darling valves are available in a broad range of sizes and types, manually or motor operated, for all normal or unusual services. Before you invest in *any* valves, find out what you stand to gain by using the proper Darling valves on your job. Simply outline your service needs for specific data . . . or . . .

ASK FOR BULLETIN No. 5002

DARLING VALVE & MANUFACTURING CO.

Williamsport 9, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ontario

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

Circle 538 on Reply Card for more data

The water enters the air ducts in the form of a fine mist sprayed through steam atomizing nozzles. Moisture content of combustion air is maintained at 79 F dew point, proved by tests to produce an optimum low rate of fireside deposit formation.

Automatic Weighing Stops Waste

At National Brick & Supply Co., Inc. — where cinder blocks are being made from mixes of cinders, sand, lime, cement, and silica — company officials estimated they were losing several hundred pounds of silica daily in their mixing operation.

Cement was being weighed out in a manually operated hopper scale that was fed by screw conveyor from an outdoor storage bin. When weighing out a batch of cement, the operator frequently went over his prescribed weight, and at times could not avoid waste by spilling and splashing. But largest losses on the whole were in overages.

Losses in the silica handling operation, also, were mostly in overages. Instead of being weighed out, silica

This scale and one adjacent to it receive cement and silica respectively from screw conveyors overhead.

was dropped into a wheelbarrow through a discharge gate located at the bottom of the silica storage bin.

The loading operator jam-closed the gate when the silica reached a level mark on the inside of the wheelbarrow. He often went over, and frequently spilled and lost material. Besides being wasteful, this method of loading created dust and potential silicosis hazard. There was relatively less waste in the cement weighing operation; but total losses were higher, since the cinder-block formula requires almost twice as much cement as it does silica.

Plant engineers solved this waste problem by placing feeding, weighing, and handling of silica and cement under automatic controls.

The two materials are now fed into two automatic scales from two storage bins via screw conveyors. Scales are set to receive a prescribed amount of material, and the screws automatically stop when the correct weight is reached. The scales drop the materials onto a Fuller Airslide which sends them on to the mixer. After the scales are discharged, the screws start feeding again automatically.

Designed and built by Richardson Scale Co., Clifton, N. J., the two automatic scales are enclosed in a single housing that is equipped with one discharge spout. Both scales are capable of turning out several weighings per minute. They are equipped with radial-type cut-off feed gates, a low-multiplication scale beam, and a weigh hopper with two straight sides for clean discharge.

Water is automatically fed to the mix. Its rate is regulated by moisture control instruments.

The mix is then discharged into a skip hoist and carried up to a hopper located above the cinder-block molding machine. During its two-shift working day, National Brick can turn out over 300 batches.

Each scale is equipped with a five-digit setback counter that records total batches of material delivered to the process. With these and the plant's recording charts, National Brick has an accurate check on its daily mixing operation.

With this automatic cement-silica weighing operation, waste has been virtually eliminated and dust is kept to a minimum.

Synthetic Mica To Be Produced Commercially

Mica, which is used as an industrial electrical insulator, is also used in many classified defense projects, such as radar, guided missiles, supersonic aircraft, and nuclear developments. Because more than 90 percent of the high ggrade mica needed in this country must be imported from India, the Senate's Minerals, Materials, and Fuels Economic Sub-Committee has listed it as a Group I Strategic Material.

During World War II Germany set up a pilot plant for production of synthetic mica. After the war this project was studied by U. S. industrial teams and the information gathered formed the basis of a research project by Owens-Corning Fiberglas Corp. and Corning Glass Works. Eventually the U. S. government entered the picture and assigned the project to the Bureau of Mines' Electrotechnical Laboratory at Norris, Tenn.

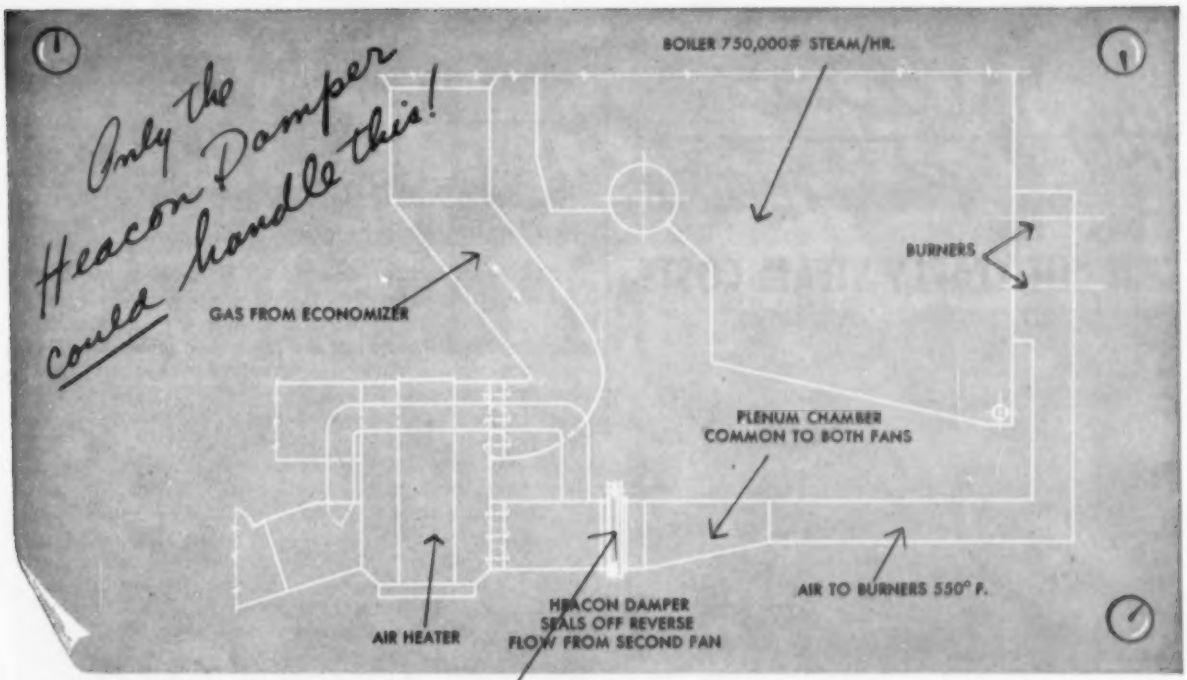
In 1953 Mycalex Corporation of America joined in the research under a cooperative agreement with the Bureau of Mines.

The result of this joint effort was development of techniques for commercial production of synthetic mica made of raw materials plentiful in this country — aluminum and magnesium oxide, silica sand, a fluoride, and potassium feldspar.

The process to be used at the first synthetic mica plant, the Synthetic Mica Corp., at Caldwell, N. J., entails electric melting of these materials in a specially designed furnace. A wholly owned subsidiary of Mycalex, the new company is expected to start production early in 1955 with an annual output of 1000 tons of high grade mica, about 10 percent of U. S. annual consumption.

Bureau of Mines' research indicates that the man-made material will be superior in some respects to natural mica. It can be made chemically pure, will function effectively in temperatures several hundred degrees higher, and can be hot-pressed and phosphate-bonded into some new "mica ceramics."

The plant will also operate an experimental furnace to find ways of producing larger crystals of new mica compounds.


Only the Heacon Damper could handle this!
BOILER 750,000# STEAM/HR.
BURNERS
GAS FROM ECONOMIZER
PLENUM CHAMBER COMMON TO BOTH FANS
AIR TO BURNERS 550° F.
HEACON DAMPER SEALS OFF REVERSE FLOW FROM SECOND FAN
AIR HEATER

One of Two Air Pre-Heaters cleaned *while* Boiler operates at half load

THERMIX HEACON

There's a big difference in temperature between the inlet and outlet sides of this Heacon Damper installation when the damper is closed. There has to be because in this large western utility, air pre-heaters are cleaned while the boiler operates at half load!

This is made possible only because Heacon Dampers can effectively shut off high temperatures without leakage . . . can assure safety of personnel while boiler is in operation.

No other damper could assure the tight sealing so necessary in this installation. No other damper could provide these important benefits:

1. Quick return on investment through savings realized by operating steam generator at one-half load or better during cleaning operation.
2. Elimination of internal strains and possible damage during complete boiler shut-down.
3. Safety of personnel during cleaning operation.

Performance will prove to you as it has for others that Heacon Dampers are the most efficient dampers available anywhere. *Performance* in this installation resulted in 6 repeat orders for a total of 25 dampers!

Heacon Dampers are designed and constructed to meet practically any pressure or temperature specification. Our engineers will be glad to discuss your damper problems with you.

Project Engineers

THE THERMIX CORPORATION
GREENWICH, CONN.

(OFFICES IN 38 PRINCIPAL CITIES)

Canadian Affiliates: T. C. Chown, Ltd. 1440 St. Catherine St. W., Montreal 25, Quebec. 983 Bay St., Toronto 5, Ontario, Canada

Circle 539 on Reply Card for more data

How 2 Dutton EconoTHERMS CAN CUT YEARLY STEAM COSTS

OFF-CENTER FIRING • ROTARY COMBUSTION
GAS OR OIL FIRED • AUTOMATIC OPERATION
NO COSTLY CHIMNEY OR FOUNDATION
ONE "PACKAGE"—FACTORY PRE-TESTED

DO YOUR DAILY and seasonal steam loads vary widely? Many owners find that *two or more* Dutton EconoTherm Boilers give big advantages over a single larger unit — especially in *lower total steam costs!*

WITH TWO OR MORE EconoTherms, you can meet varying steam demands fast — and at *peak fuel efficiency.* Yet you save fuel each day and all year by operating just *one* unit during warmer weather, "off hours", nights, week-ends and holidays.

MULTIPLE UNITS give *extra* protection from plant shutdowns . . . and as your plant grows, it's easy to add another "packaged" EconoTherm. Because steam costs depend mostly on fuel and labor costs, *every EconoTherm feature* is designed to keep costs low!

CALL YOUR DUTTON REPRESENTATIVE — he'll carefully analyze your particular needs and offer cost-cutting suggestions.

CHECK FIRST with

WRITE FOR DUTTON ECONOTHERM BULLETIN EC-52C

Dutton BOILERS

Division Hopman-Dutton Company
KALAMAZOO, MICHIGAN
Boiler Builders Since 1880
Four Types — Sizes from 5 to 300 H.P.
Circle 540 on Reply Card for more data

ideas in action

—Starts on page 100

Limestone Mine Is Converted Into Underground Freezer

Storing materials underground in caves or worked-out mines has inherent economies; temperature is low and constant and construction costs are considerably less since walls and roofs are already in place. The federal government made use of a limestone quarry near Atchison, Kansas, during World War II, to store surplus foods. The same cave is now stocked with surplus machine tools stored by the Army.

Near Kansas City, Mo. refrigerated storage rooms are now being built in the worked-out section of an operating limestone mine. Almost nine acres will be turned into a huge underground freezer to be used as an in-transit warehouse for edible products being shipped from the west coast to various parts of this country and abroad. Most of the storage rooms will be maintained at -10 F with about ten percent of the space kept at 38 F.

A spur of the Santa Fe Railroad will extend 1000 ft into the cave which is owned by Inland Cold Storage

Eight freezer rooms constructed on each side of 1000 ft railroad spur are insulated with cellular Foamglas.

Co. Eight refrigerated rooms lie on either side of the siding with storage space for 2500 carloads of frozen foods. A loading dock for motor trucks, which will adjoin the track entrance, will provide space for 15 trucks.

Walls between the rooms are being lined with five inches of Foamglas cellular glass insulation, a product of Pittsburgh Corning Corp. On perimeter walls a total of six inches, double coursed, will be used. Piping which carries cold brine at -24 F. to the five cooling units in each room will also be Foamglas insulated. Engineers estimate that even with a complete refrigeration breakdown, temperature rise in the below zero rooms would be only 2 or 3 F in two weeks.

Engineers Define "Automation"

In a survey conducted among engineers, technicians, and industrial executives in ten major industry groups, Minneapolis-Honeywell's Industrial Div. found "automation" was the favored word of 82 percent of those

(Continued on page 126)

BREECHINGS · STACKS

AIR AND GAS DUCTS

PLATE FABRICATION FOR POWER PLANTS

KIRK AND BLUM
FABRICATION

Whatever your requirements in fabricated plate, sheet or structurals for power plant use . . . call on experts!

Kirk & Blum has fabricated a variety of power plant needs as big as the mammoth breeching section shown here. In a 150,000 sq. ft. plant, with crane capacity to 25 tons, Kirk & Blum has complete facilities to produce, pre-assemble and load the largest fabrication. Kirk & Blum has the men, materials and experience to do the job quickly and economically.

For detailed literature, write: The Kirk & Blum Mfg. Co.
3174 Forrer St., Cincinnati 9, Ohio

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bulletins

. . . for listing of the bulletins just received see page 32

AIR CLEANING & DUST COLLECTION

250—Industrial Dusts

"The Collection and Recovery of Industrial Dusts," 32-page manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains the operation of each type of collector. Buell Engineering Co., Inc.

251—Electrical Precipitators

Booklet 2-ATC covers the history and fundamentals of electrical precipitators: design and construction, dimensions and capacities, electronic power supply, selenium power supply, and installation stories. The Aerotec Corp.

252—Tubular Dust Collectors

Booklets 2-PDC and 3-PDC on mechanical dust collectors cover capacities and efficiencies, dimensions, construction, and the decantation method used on installations where re-injection of large, unburned high carbon particles is required for economy. Prat-Daniel Corp.

253—Industrial Dusts

Booklet 3-TTC gives a brief background of modern dust problems and an approach to their solution. Discussed are sources of dust, determining dust size, prediction, fly-ash emission codes, types of dust and methods of control. The Thermix Corp.

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254—Dust and Fume Removal

This 19-page bulletin, 610, pictures and describes the standard units that go to make up the Multi-Wash System for the removal of air-borne dust, fumes, vapors, and odors. Claude B. Schneible Co.

AIR CONDITIONING-HEATING & REFRIGERATION

255—Temperature, Moisture Control

Precision control of air temperature and moisture enable you to manufacture your product in any climate, at any season, according to six-page bulletin 122. The Type "A" air conditioner described, for drying or moistening of air, is shown in typical installations. Niagara Blower Co.

256—Unit Heaters

Catalog CUH 846-A gives the complete story on Grid unit heaters. Catalog BC-1040 describes Grid blast coils for process drying. How the construction of the unit heaters prevents electrolytic corrosion is explained in booklet "Corrosion in Unit Heaters." D. J. Murray Manufacturing Co.

257—Woven Electric Heaters

Pre-Fab woven electric heaters are described in folder 1548 which illustrates typical uses and gives application data for this versatile heat source. Suggested uses such as for heating gearboxes, local comfort heating, and for preventing condensation are listed. Pre-Fab Heater Co., subsidiary of Edwin L. Wiegand Co.

BOILERS & STEAM

258—Water-Tube Generator

Completely packaged Water Tube Type D Superior Steam Generator in 17 sizes with capacities from 8000 to 40,000 lb of steam per hr, is described in detail in eight-page catalog 5M-54. Illustrations show features of construction and operation. Superior Combustion Industries, Inc.

259—Steam Cost Calculator

Made of heavy board, this Steam Cost Calculator will enable you to read directly cost of steam per hp for installations using oil, coal, or gas. It also gives a direct reading of efficiency of the system. Hapman Dutton Co.

260—Combustion Sampling

The full story of a newly developed sampling system for continuous trouble-free sampling and oxygen measurement of combustion processes is told in bulletin 703. The equipment described is designed for steam generating plants, rotary kilns and driers, open hearth furnaces, and tanks. Arnold O. Beckman Co., Inc.

261—Condenser Operation

"Proportioning of Surface Condensing Equipment," 20-page booklet 19B8201, gives the latest data and technical information on problems of power plant engineers. It provides formulae of use in calculating performance of a given condenser and carries a variety of curves and tables for quick reference. Allis-Chalmers Mfg. Co., General Machinery Div.

262—Boilers and Accessories

"Products and Facilities," 69-page general catalog G-63-A shows representative examples of products manufactured and some of the numerous facilities for producing them, together with illustrations of typical installations. Cross sections, flow diagrams, cut-aways, and photographs are given for each unit. Babcock & Wilcox Co.

263—Package Generator

Six-page foldout B-3100 describes in detail the Ticosteam package steam generator, a three-pass, constant furnace pressure, forced draft, fire tube, horizontal boiler which is fitted with burners of special design permitting use of any desired type of gas or fuel oil available. The Titusville Iron Works Co., Div. of Struthers Wells Corp.

264—Vertical Unit Boiler

More than 25 years of development, manufacturing, and application experience are reflected in the design of the Type VU-10 vertical-unit boiler described in 16-page bulletin VU 10-8. Advantages and design features are discussed. Combustion Engineering, Inc.

265—Refuse and Wood Burning

Engineering data concerning spreader stokers installed to burn refuse or wood are contained in 24-page booklet 505. Stationary, manual dumping, power dumping, and traveling grate installations having maximum capacities from 10,000 to 275,000 lb steam per hr are described. Photos show units in operation in various industries. Detroit Stoker Co.

266—General Catalog

A wealth of research, engineering, and manufacturing experience, gained since the founding of this company in 1880, is incorporated in the products described in four-page folder. Steam generators, heat transfer equipment, pressure vessels, valves, and fittings are shown. Henry Vogt Machine Co.

267—Pressure Equipment

One of the country's oldest manufacturers of equipment and accessories for plants piping steam, air, and gas under pressure, has published catalog 400, covering its line of separators, traps, and boiler trim. A condensation of the information in catalogs 500, 600, and 700, the booklet gives technical data in chart form. Wright-Austin Co.

268—Fintube Boilers

Fintube boilers and heat transfer products incorporating this company's 17 years

NOTE—Each bulletin has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

NO Reducing Valve Needed

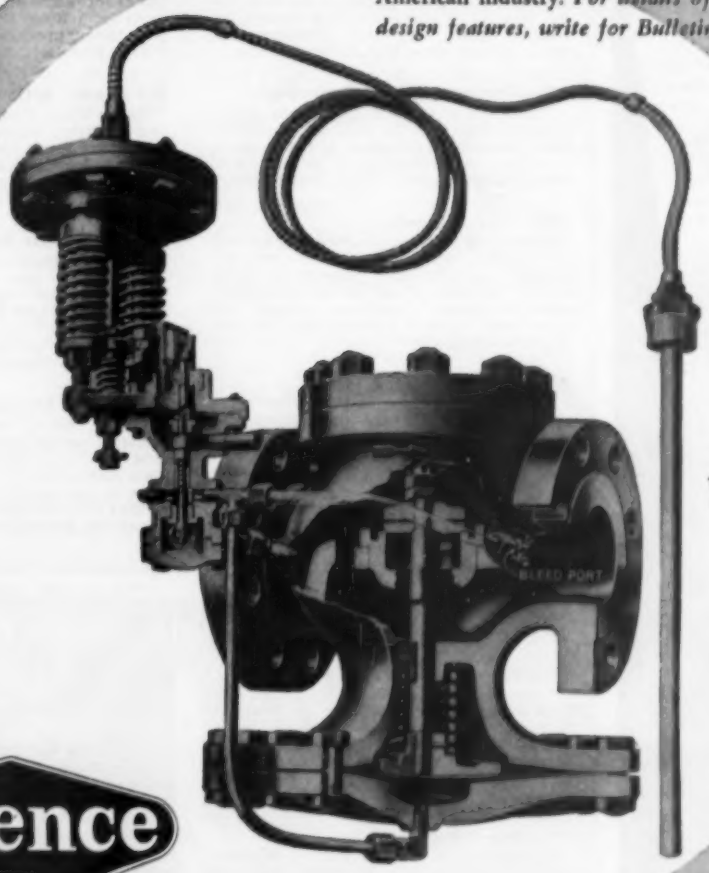
Here's real economy in temperature control.

Because Spence Temperature Regulators are designed to limit heater steam pressures to an adjustable maximum, the need for a separate reducing valve is completely eliminated.

The Spence Regulator takes steam directly from the boiler or high pressure line, reduces the pressure and regulates the flow as required to maintain a constant temperature output from the heater.

This means one relatively small combination pressure and temperature regulator replaces a reducing valve of the same size and a larger temperature regulator. Practically the entire cost of the large separate temperature regulator is saved. And, the total saving would also include the cost of a 3-valve by-pass along with all labor for installation.

This design feature is just one of the reasons for the thousands of Spence installations throughout American industry. *For details of other important design features, write for Bulletin T50.*



SPENCE
TYPE ET150
Temperature
Regulator

Spence

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

98-191

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unequaled
for Flexible
service
For what purpose do you use flexible metal hose? To control expansion, contraction, vibration . . . to solve a misalignment, a conveying problem?
Whatever your application, you are buying flexible service. For your dollar's sake, it is well to know that Atlantic metal hose returns more flexible service than any other hose. Your own performance records will prove it.
For every application, there is an Atlantic flexible metal hose that is JOB TESTED AND CERTIFIED!
Write for Catalog 500 . . . See our catalog in Sweet's File for Product Designers.
Manufacturers of Seamless and Interlocking Flexible Metal Hose in Steel, Stainless Steel, Monel, Bronze . . . Sizes ⅛"-36" I. D. with appropriate fittings.
ATLANTIC
METAL HOSE CO. INC.
324 Dyckman St.,
New York 34, N. Y.
Circle 543 on Reply Card for more data

bulletins

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of design experience in the chemical and petroleum industries are described in six-page folder 542. Brown Fintube Co.

269—Coal-Burning Installation

"Burning Bituminous Coal the Modern Way," contains 24-pages of case histories from industries of all sizes and types. Engineering survey results for equipment such as boilers, stokers, coal and ash handling units, and automatic controls, include annual fuel consumption and operating costs. Bituminous Coal Institute.

270—Draft Inducers

The biggest contribution to the cause of improved furnace operation in recent years has been the mechanical draft inducer, according to 12-page booklet I-52. Six causes of poor chimney draft are listed. L. J. Wing Mfg. Co.

271—Liquid Level Indicator

Do you have to guess at your boiler water level? Nineteen-page booklet WG 1824 describes the Yarway Remote Liquid Level Indicator and shows how it is used not only for boiler water indication but for feed water and deaerating heaters, expansion tanks, hot flow softeners, and other similar uses. Yarnall-Waring Co.

272—Packaged Steam Generators

Construction of packaged steam generators is described in eight-page bulletin 1050. Auxiliary equipment is listed and a blueprint with dimensions of a typical boiler room is given. Ames Iron Works.

273—Tube Cleaners

Bulletin 43 introduces a new geared tube cleaner for removing scale in heat exchanger and condenser tubes of ⅜ to 2½ in. ID. The unit is said to be particularly effective where conditions require low speed and extreme power. The Airetool Manufacturing Co.

274—Condenser Tube Inserts

How to restore leaking condenser tubes to service by sealing off the deteriorated portion with inserts, is the subject of four-page leaflet 500. Tube cleaners, expanders, and maintenance tools are listed. Thomas C. Wilson, Inc.

275—Boiler Cleaning

Four fact-filled pamphlets explain how this company's products will help you solve algae problems, increase boiler efficiency with use of the Ever Clean boiler process, remove rust, and prevent corrosion. North American Mogul Products.

276—Boilers and Equipment

Sixteen-page bulletin SB-50, "Erie City Boilers and Allied Equipment," describes custom designed steam generators for central station or industrial application. A number of water tube types available as well as a line of fire tube waste heat units are pictured. Erie City Iron Works.

277—Flue Dampers

Booklet 1-HEA on curtain type dampers for flue gas control explains what the damper is and does, construction, dimensions, installations, and gives case histories. Booklet shows drawings and photos of a variety of damper types. Heacon, Inc.

278—Tube Expanders

Rolling and flaring tube expanders and operating accessories are listed in eight-page catalog 68. Illustrations, specifications, and recommendations are included. The Gustav Wiedeke Co.

279—Atomizing Oil Burners

The cheapest grades of oil or tar can be completely atomized and efficiently burned with Type SA steam atomizing oil burners according to 16-page bulletin 21. Models for various special uses are described. Furnace design and construction for efficient operation is stressed. National Airoil Burner Co., Inc.

280—Soot Blowers

Bulletin 1137 gives complete information on the Model G9B blower which employs a fixed position rotating element to clean a large number of tubes by sweeping through a pre-determined arc. The bulletin suggests various uses. Diamond Power Specialty Corp.

281—Heavy-Oil Burner

Fuel savings is the theme of eight-page foldout AD1131 which describes the new "4" Hev-E-Oil burner. Illustrations show compactness and simplicity of design. Cleaver-Brooks Co.

282—Packaged Steam Generators

Basic construction and design features of plant assembled steam generators, with or without superheat, are presented in illustrated 20-page booklet P6-51-2. Includes tables of engineering specifications for units from 10,000 to 30,000 lb steam per hr and design pressures from 250 to 825 psi. Foster Wheeler Corp.

283—Boiler Baffles

"More Steam from Your Boilers," a four-page folder, explains how streamlined baffles are applied to all types and sizes of boilers. Drawings indicate how they are installed in units to secure crossflow of gases. The Engineer Co.

284—Automatic Burner

Newly designed automatic burner, model PK-54, for oil, gas, and oil or gas, is described in four-page folder 430. For capacities to 42,000 lb steam per hr, the burner is described as a complete, automatic combustion unit including blower and controls. Peabody Engineering Corp.

285—Boiler Service Valves

Surface blow, bottom blow-off, water column blow-off, and connections are covered in 22-page bulletin E125, with complete specifications, materials, and dimensions of each type. Valve operation is explained by illustration. Fire protection valves are included. Everlasting Valve Co.

286—Boilers & Stokers

Over 88 years experience are embodied in the design and construction of Scotch Marine type portable boilers says 28-page catalog. Photographs and cross-sections illustrate various models ranging in capacities from 6 hp up to 25 hp. Underfeed stokers for this type boiler are described. The James Leffel & Co.

287—Firing Equipment

Over 50 years of leadership in the manufacture of industrial-commercial firing equipment is reflected in 19-page general catalog 3048. Schematic drawings, layouts of typical installations, cutaway views of burners and burner parts, and photographs are included. Petro Division.

288—Oil & Gas Burners

Advantages of preassembled oil, gas and combination oil and gas burners are listed in 8-page bulletin P-152. The units contain all necessary control equipment, and require only mounting to furnace and service connections. Units in sizes from 50 to 900

How Olin Mathieson Uses Childers Jacketing For Insulated Lines

Jacketing problems at new plant ranged from covering tall towers to irregularly-shaped heat exchangers. Read how aluminum jacketing solved these problems.

More than 244,000 square feet of Childers .006" Jacketing and 35,000 square feet of heavy weight Childers Jacketing was used in this new Olin Mathieson plant to weatherproof insulated lines, towers and vessels. Close-up above shows how aluminum jacketing was applied with strapping and seals.

Low first-cost, long life, and easy installation were the big reasons Olin Mathieson Chemical Corporation used Childers Aluminum Jacketing for outdoor insulated lines in their new Brandenburg, Ky., petrochemical plant.

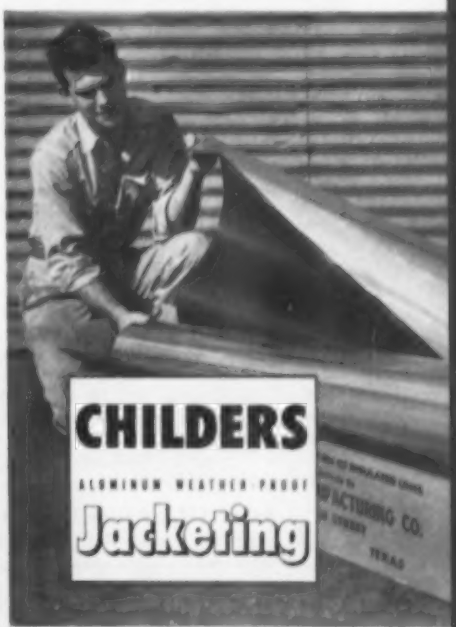
Mathieson used Childers standard weight Jacketing on their insulated lines. Heavier weights of Childers Jacketing were used on high towers and vessels where a stiffer material was needed to support the vertical weight of the jacketing.

Engineers report that Childers Jacketing is inexpensive to apply. It comes in easy-to-handle rolls 4 ft. wide and 100 ft. long. Just pliers and a pocketknife are the only tools needed to apply. And because the jacketing is aluminum it needs no painting . . . stays clean and new looking even after years of service.

Childers Jacketing is easily removable, too. Just remove the strapping and jacketing can be taken off for inspection of the lines. Then same jacketing can easily be put back on the insulated line.

Immediate shipment from our large factory stocks can eliminate costly delays in construction or plant improvement schedules.

Try this low-cost protection in your plant. Write today for engineering data and information. You can order a 400 sq. ft. roll to test on one of your insulated lines. No obligation. Address: Childers Manufacturing Company, Department IP-2, 3620 West 11th St., Houston, Texas.



Each roll of Childers Jacketing comes individually packed like this in a heavy corrugated carton. Rolls are 4 ft. wide. With moisture barrier attached they are 100 ft. long; without moisture barrier they are 200 ft. long. They are well protected for field storage if kept dry. Individual boxes are light enough for one man to handle. (Adv.)

How to apply Childers Jacketing:

1. Best method of attaching jacketing is aluminum strapping and seals. Strapping can be pulled plenty tight with pliers like this. Other method is to use sheet metal screws.

2. A two-man crew can apply jacketing fastest. No special shop work or roll forming is necessary. Only tools needed are a pliers and a screw-driver or wooden wedge.

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SAVE TIME!

When removing damaged tubes use the new

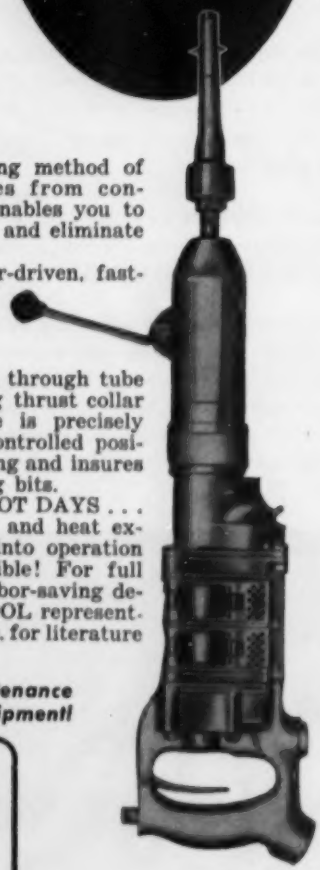
AIRETOOL

internal tube cutter

Now . . . a *new*, modern, cost-saving method of removing leaky or damaged tubes from condensers and heat exchangers that enables you to accomplish overhauls in short order and eliminate costly downtime.

The Tube Cutter is a powerful air-driven, fast-cutting lightweight tool that is equally at home in field or plant! Self-centering blades of tough tool steel quickly and easily cut steel or non-ferrous tubes *internally*, through tube sheets up to 4" thick. A ball-bearing thrust collar prevents friction, and cutting rate is precisely governed by the operator; a lever-controlled positive feed eliminates gouging or burning and insures long life for each of the two cutting bits.

Replace faulty tubes in HOURS, NOT DAYS . . . cut costs of overhauling condensers and heat exchangers and get vital units back into operation sooner than you would think possible! For full information on this new time and labor-saving development, see your nearest AIRETOOL representative, or write to The Airetool Mfg. Co. for literature and complete details.



Solve ALL of your Tube Maintenance Problems with AIRETOOL Equipment!

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MANUFACTURING COMPANY

SPRINGFIELD, OHIO

BRANCH OFFICES: New York • Chicago • Philadelphia • Tulsa • Baton Rouge • Houston

REPRESENTATIVES in principal cities of U. S. A., Canada, Mexico, South America, England, Japan

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bulletins

—Starts on page 108

hp are listed for four common gas pressures and all grades of oil. Coen Co.

289—Package Boiler Controls

Specifications for the fully automatic, all electric metering type packaged control for shop assembled boilers are given in four-page bulletin 54-1088-239. Schematic drawing shows a typical packaged control system for a combination oil or gas fired boiler. The Hays Corp.

290—Remote Reading Gages

Eight-page catalog 246 covers in detail the three standard types of Convex Scale and Flat Scale Truscale Remote Reading Gages, showing how these gages bring liquid level indication down to where it can be seen easily — protecting valuable equipment and preventing expensive shutdowns. Jerguson Gage & Valve Co.

291—Check Your Steam Costs

"Have You Checked Your Steam Costs Lately?" This 15-page handbook is a non-technical presentation of vital interest to everyone considering merits of replacing existing boiler equipment or considering purchase of new boiler equipment for a new operation. Orr & Sembower, Inc.

TO REQUEST FREE BULLETINS

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

292—Spinning Gas Technique

Operation and advantages of the Continental Automatic Boiler's "spinning gas technique," a method of obtaining maximum heat transfer with a simplified design, is explained in four-page booklet BE-4. A cut-away view of one of these packaged boilers shows method of injecting the air and other features. Boiler Engineering & Supply Co., Inc.

293—Gas Burners

Layout of gas piping, accessories, and fittings for fully automatic high-low operation of the Model R nozzle-mix type gas burners is shown in two-page bulletin 177. Both standard equipment and extra equipment for special applications are listed. Preferred Utilities Mfg. Corp.

BUILDING MATERIALS & MAINTENANCE

294—Flooring

"Handbook of Building Maintenance," gives valuable information on keeping your plant in efficient working order. Instant-Use concrete floor patch is described with suggestions for its use, along with data on other materials for repairing floors. Flexrock Company.

295—Repair Cements

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. Smooth-On Mfg. Co.

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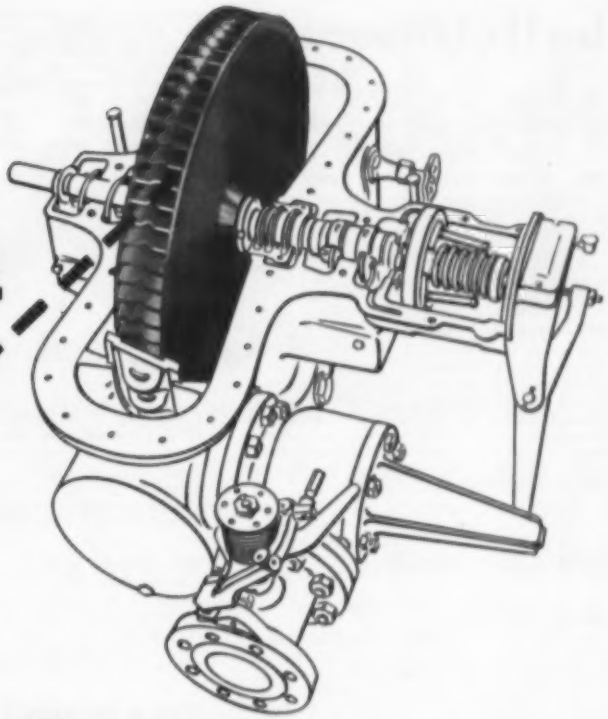
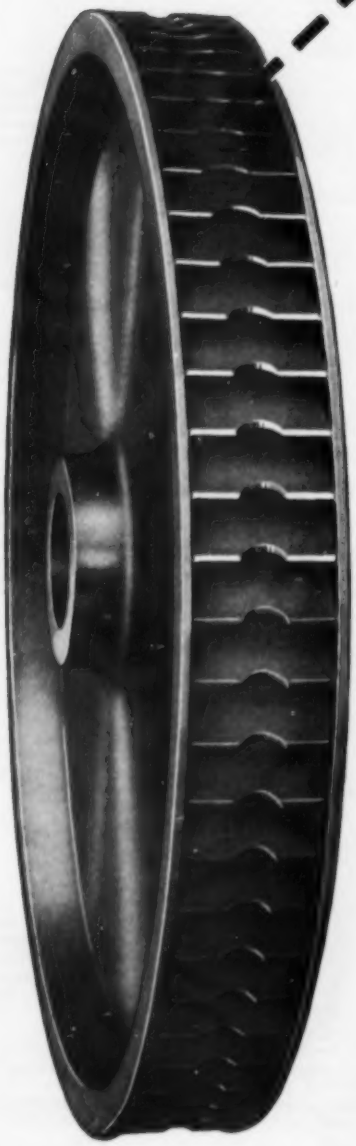
TERRY SOLID WHEEL





..."trade mark" of a trouble-free turbine

This is the rotor of a Terry solid-wheel turbine. There are a number of reasons why it has become a symbol for reliable, trouble-free operation.

First, because the wheel is a single forging, in which a series of semi-circular buckets is milled, there are no separate parts to become loose or work out.

Second, because the power-producing action of the steam takes place on the curved surfaces at the back of the buckets, blade wear is of little consequence. Wear does not materially affect horsepower or efficiency.

Third, because the steam enters the buckets in a direction at right angles to the shaft, there is no need for close axial blade clearances. The blades cannot foul. There is a one inch clearance on either side of the wheel. In addition, the blades are double rim protected.

These are only a few of the reasons why the Terry solid wheel has become a "Trade Mark" for trouble-free turbine performance. For complete details, send for a copy of bulletin S-116. No cost or obligation.

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

TT-1197

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bulletins

—Starts on page 108

296—Cutting Maintenance Costs

Installation pictures and stories in this publication known as **"Industrial News,"** will show ways of cutting your maintenance costs or increasing production through the use of this company's industrial rubber products. Gates Rubber Co.

297—Standard Fasteners

Savings in cost and in delivery time by specifying and ordering standard fasteners instead of special products are pointed out in 32-page catalog 10M-BP. Applications of each product in the Unbrako Standards line are indicated in line drawings. Diagrams keyed to specification tables simplify measurement references. Standard Pressed Steel Co.

COMPRESSORS & BLOWERS

298—Compressors

Horizontal heavy duty air and gas compressors, Type T, are described in 16-page bulletin 728-S. Cross sections of crankshaft, inlet valve unloading system, compressor cylinder and valves, and the complete compressor add to the value of the booklet. Chicago Pneumatic Tool Co.

299—Rotary Compressors

Operation and construction of single-stage water-cooled rotary compressors and vacuum pumps, applicable to every air or gas handling requirement, are described in 12-page bulletin 16B8126. It gives general specifications along with typical air piping diagrams. Allis-Chalmers Mfg. Co.

300—Separator

The ASF (after cooler-separator-filter) designed to deliver cool, clean, dry compressed air to pipelines is described in four-page folder 10. Labeled cut-away drawing explains operation and advantages. The Zip Action trap used to drain all sizes of ASF units is also shown. Jas. A. Murphy & Co.

CORROSION CONTROL

301—Transmission Line Corrosion

"Corrosion Control of Electrical Structures and Equipment," 17-pages, is designed to give practical painting information on all phases of transmission and distribution work. Subox, Inc.

302—Rubber Linings

Application of rubber lining to prevent corrosion of tanks, pipes, and valves is discussed and pictured in four-page folder. In addition, two-page reprint tells how rubber lining can stop circulating pipe corrosion. La Favorite Rubber Mfg. Co.

DIESEL & GAS ENGINES

303—Dual Fuel Engines

In 36-page bulletin S-500-B757 are photographic examples of each application, together with vital statistics, case histories, and comments on fuel consumption for dual fuel engines. Each feature is treated separately. Worthington Corp.

ELECTRICAL DISTRIBUTION

304—Air Circuit Breakers

Bulletin 5107-DR-1 contains four pages of facts, figures, features, and photographs on types KA, KB, KC, and LG Urelite air circuit breakers, and on weatherproof and dust-tight enclosures. I-T-E Circuit Breaker Co.

305—Power Transformers

Power transformers being built at the new mass production Rome, Ga. plant are described in 40-page booklet GEA-6108. It cites applications and features of standardized single phase and three phase units, ranging from 501 to 10,000 kva. General Electric Co.

306—Dry-Type Transformers

"Latest Developments in Dry-Type Transformers," seven-page catalog 153-A, presents the advantages of air-cooled units designed and constructed primarily for inside installations. Sorgel Electric Co.

307—Power Factor Correction

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. Typical wire connections are shown. Sprague Electric Co.

308—Circuit Breakers

"What You Should Know About Circuit Breakers," 16-page manual 101, explains the operating principles of basic circuit breaker design. Included are simplified diagrams of three basic types. Heinemann Electric Co.

309—Commutators and Slip Rings

"Commutator and Slip Ring Maintenance," 30-page handbook, covers trouble shooting, brush maintenance and operating procedure, and general maintenance. Illustrations show the operations described. Ideal Industries, Inc.

310—Light Dimming Equipment

Light dimming equipment, available as packaged assemblies, is the subject of 12-page bulletin D651P. Described are units for different numbers of circuits requiring up to 2000 w each, and for various types of a-c operation. Wiring diagrams are included. The Superior Electric Co.

311—Flexible Conduit

Extra flexible Sealtite conduit for electrical wiring of machine tools and industrial equipment is pictured and described in four-page pamphlet EF-531. It points out the fact that this liquid-tight, extra flexible conduit is approved for these uses by the joint Industry Council. American Metal Hose Branch, American Brass Co.

ELECTRIC UTILIZATION

312—Variable Speed Motors

How variable speed motors are used to improve production is described in 16-page brochure 1797. In addition to describing advantages the booklet describes design theory and construction features. U. S. Electrical Motors, Inc.

313—Motor Control Center

Savings in space and expense and improved performance is explained in 12-page bulletin 170. Electrical and constructional details of these groups of combina-

HENSZEY
CONTINUOUS BLOWDOWN
packet-type

complete, automatic control of boiler water concentration

Also Standardized or Special Units for ALL CAPACITIES.

PREVENTS PRIMING
PREVENTS FOAMING
PREVENTS SLUDGE
PREVENTS SCALE
(with simple chemical treatment)

This compact self-contained unit is completely assembled. Can be installed by your own men in hours. It provides completely automatic control of boiler water concentration regardless of variations in boiler load. This is accomplished WITHOUT HEAT LOSS. Maintain clean efficient boilers for substantial savings in fuel, equipment and manpower.

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Continuous Blowdown and Boiler Plant Specialties • Boiler Feed Regulators • Distillation Systems • Heat Exchangers • Feed Water Meters • Flow Indicators • Proportioning Valves
Also PROCESS EVAPORATORS, PREHEATERS, and SPRAY DRYERS

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Super Tough

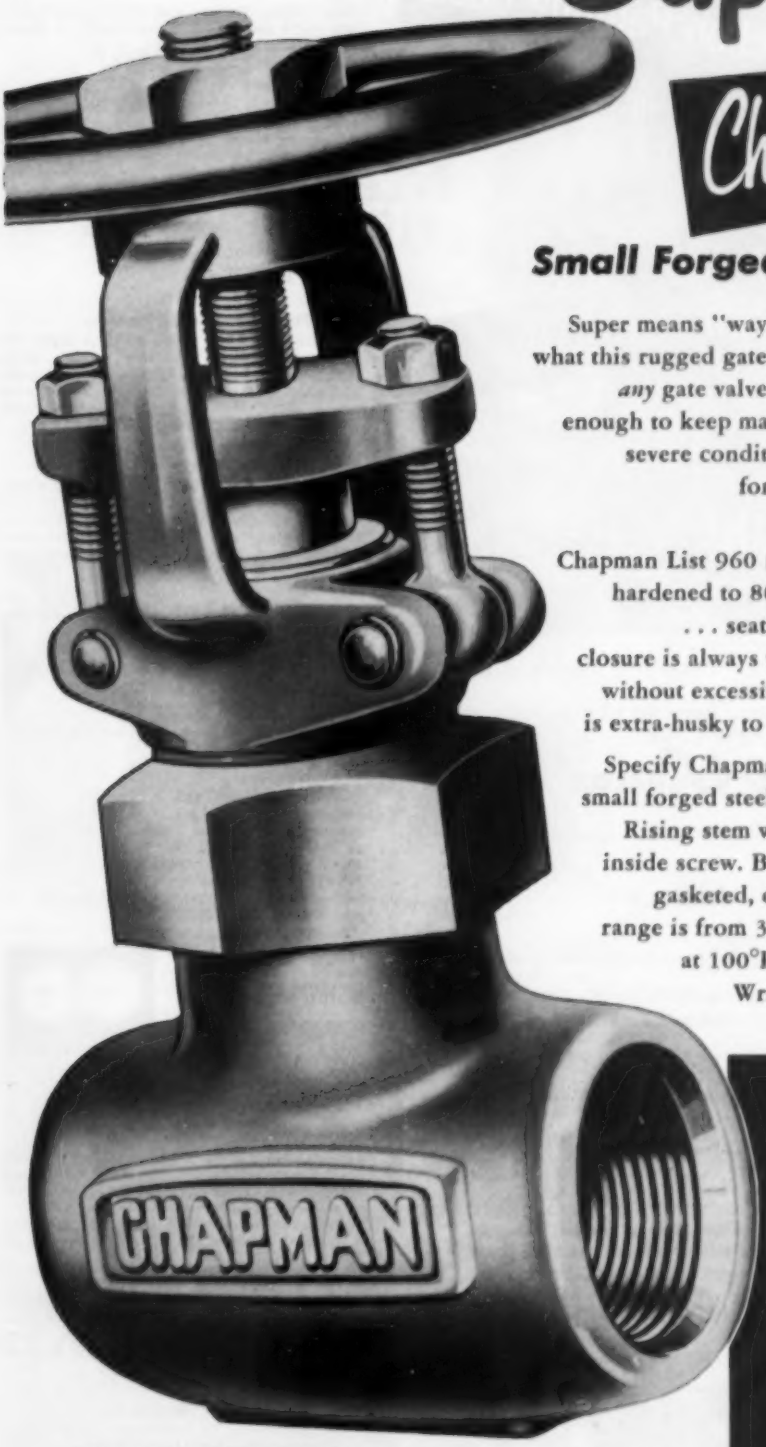
Chapman List 960

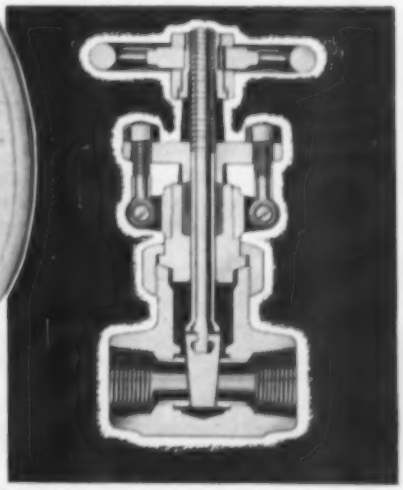
Small Forged Steel Gate Valve

Super means "way beyond the ordinary" and that's just what this rugged gate valve is . . . it's tough enough to lick *any* gate valve problem in its range . . . dependable enough to keep maintenance costs down under the most severe conditions. That's why List 960 is specified for more different applications than any other valve of its kind.

Chapman List 960 is tough because . . . wedge faces are hardened to 800 Brinell, so they won't seize or gall . . . seat rings are hardened stainless steel, so closure is always tight and operation is always smooth, without excessive wear . . . stem-and-gate connection is extra-husky to stand up under even unusual stresses.

Specify Chapman List 960 for every use you have for small forged steel gate valves. In sizes from ¼" to 2". Rising stem with yoke (shown) or rising stem with inside screw. Bonnet joint is either metal to metal or gasketed, depending upon application. Pressure range is from 380 pounds at 1000°F to 2000 pounds at 100°F. For higher ratings, specify List 990. Write today for your copy of Catalog 10.





The CHAPMAN Valve Manufacturing Co.
INDIAN ORCHARD, MASSACHUSETTS

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This has been proved many times over in plants such as this because ALL Subox & Subalox PAINTS

1. Contain lead-suboxide... Dependably protect against rust and corrosion.
2. Can be used as a complete paint system or over standard shop primers.
3. Are decorative in appearance, washable and easy to keep clean.
4. Available in a variety of attractive metallic colors, neat but not gaudy—blend well with wall and floor tiles.
5. Are equally satisfactory for weather exposure and interior use.
6. Can be applied by brush, spray or dip with minimum fire hazard.
7. Are economical in cost... have long life... assure minimum maintenance.

With these characteristics, a single coat of Subox or Subalox often suffices, or two coats will frequently replace the usual three.
Write for "PLAN PAINTING OF NEW PLANTS TO REDUCE COSTS"

Subox Inc.

9 Fairmount Plant, Hackensack, N. J.

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bulletins

—Starts on page 108

tion motor starters and their components are fully described. Arrow-Hart & Hegeman Electric Co.

314—Motors

Advantages of the various types of motors made by this company are given in four-page folder 23. Descriptions of single-phase and polyphase motors are included along with a listing of their specifications. Wagner Electric Corp.

HEAT EXCHANGERS & WATER HEATERS

315—Injection Water Heaters

Steam injection water heaters with the pressurizer piston for safe, quiet, automatic control are described in four-page pamphlet WH12A. How the unit saves space, time, fuel, and maintenance costs is explained. Pick Manufacturing Co.

316—Water Heaters

A streamlined system of heating water and process liquids quickly and at low cost is explained in this bulletin. The Instant Heater described eliminates the need for reducers. Cross-sectional drawings explain how unit operates. Johnson Corp.

TO REQUEST FREE BULLETINS

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317—Heaters

Horizontal and vertical heaters in steel, copper lined, copper-silicon, cement lined, clad and galvanized construction, as well as the low-flow design are each cataloged as to weights, dimensions, construction details, and capacities—with conversion tables, in 48-page catalog 18. The Patterson-Kelley Co., Inc.

INSTRUMENTS & CONTROLS

318—Gage Catalog

The four important questions to ask before you buy gages are listed in comprehensive 68-page catalog 64. Whether you need gages for replacement on operating equipment or for installation on new equipment, you will find complete information in this booklet. U. S. Gauge Div., American Machine and Metals, Inc.

319—Temperature Regulators

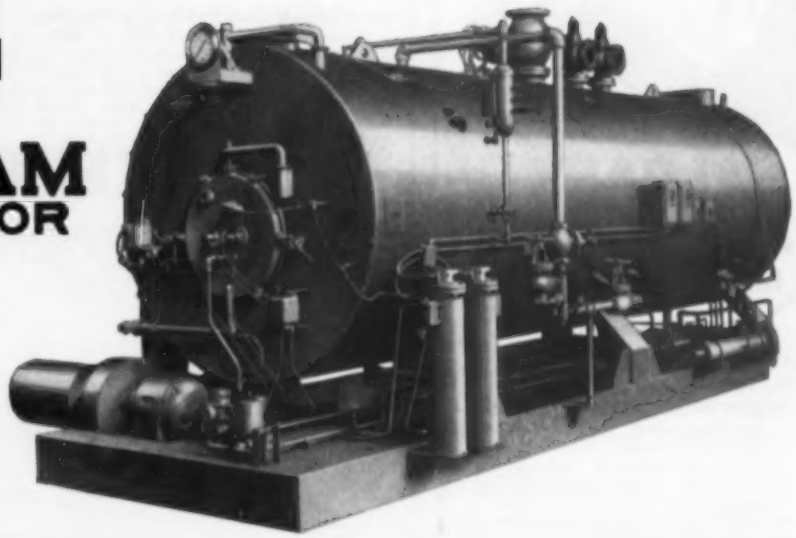
Bulletin 330 fully describes a simple, self-operating temperature regulator for plating, anodizing, bonderizing, pickling, cleaning and rinsing solutions. The Powers Regulator Co.

320—Temperature Regulators

Recommended installations of temperature regulators for instantaneous water heaters, storage water heaters, and forced air heating systems are shown in three line drawings in four-page folder 1006. Spence Engineering Co., Inc.

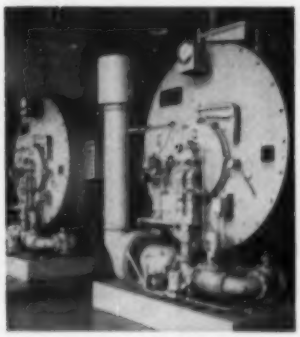
GET ALL THESE ADVANTAGES

WITH AN AMESTEAM GENERATOR



For:
PROCESSING
HEAT — POWER

20 sizes, 10 to 600 H.P., 15 to 200# W.P., oil, gas or oil-gas combinations with quick fuel switchover feature.



FULLY ASSEMBLED

All piping, wiring and operating parts completely assembled and tested at factory — units shipped in ready-to-fire condition!

EASY TO CLEAN

Ames-designed davit hinged flue covers and baffle provide quick and complete access to the furnace and all tubes.

SAVINGS IN FIRST COST!

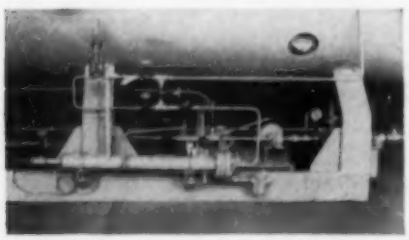
Your purchase price includes complete unit — no hidden "extras" to buy later on!

SAVINGS AT INSTALLATIONS

Just set on level concrete floor, connect to service lines and breeching. Nothing to assemble. No brick work required.

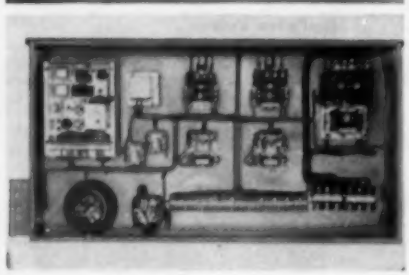
SAVINGS IN OPERATION

A minimum of supervision — lower manhour requirements for maintenance — easily replaced inexpensive plastic refractories — 80% thermal efficiency.



AMPLE ROOM

underneath for servicing auxiliary equipment. Central panel at eye level.



AUTOMATIC

operation, fully safeguarded, is provided by factory installed and tested control system.

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AMES IRON WORKS, INC.
Oswego, N. Y., Box F-15

Gentlemen:

Please send me further information on AMESTEAM GENERATORS and name of nearest representative.

NAME .....

COMPANY .....

ADDRESS .....

AMES IRON WORKS INC.

BOX F-15 OSWEGO, N. Y.

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ALBANY

a time tested line of lubricating products

ALBANY LUBRICANTS

ALBANY PRESSUREGREASE UNIVERSAL
For Cups — Ball Bearings — Water Pumps — Universal Joints. Waterproof — Exceptionally high melting point. Soft enough for gun application.

ALBANY GREASE
A cooling lubricant for operating temperatures from 110° F to 200° F.

ALBANY PRESSUREGREASE
A superior waterproof mineral oil grease of high viscosity. Comes in Liquid, Soft, Medium, Hard and Graphite Pressuregrease Soft and Medium.

ALBANY BEARING LUBRICANT
(Ball or Roller Bearing)
Will not separate or oxidize assuring long life to bearings. May be used in hand grease guns.

ALBANY GEAR LUBRICANTS
Retards wear, quiets gears. Waterproof. Will not drip when gears are idle or in motion.

ALBANY PENETRATING OILS
(Clear or Graphite)
Quick-acting. Cuts rust as well as lubricates. Loosens sticky valves, eliminates squeaks.

ELECTRICAL DIVISION

Albany RBR Wire Pulling Compound

Albany Improved Cable Pulling Compound

Stearine Candles & Flux

Your Supply House Has These Items in Stock

1868-1955

BUT MORE MODERN THAN EVER

ADAM COOK'S SONS, Inc.
Mfrs. of Albany Lubricating Products
LINDEN, NEW JERSEY

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bulletins

—Starts on page 106

321—Temperature and Pressure Control
Through years of experience in instrument design and manufacture, this company has developed a specialized line of equipment for the recording and indicating of temperature and pressure. Seven-page bulletin G-156-A shows typical examples of such equipment with lists of specifications. The Electric Auto-Lite Co., Instruments and Gauge Div.

322—Flow Meters
With an alarm control, the flow meters described in this bulletin have only three moving parts. How they operate to ring a bell, light a light, or activate a motorized valve is explained by means of illustrations. Henszey Co.

323—Electrical Controls
Redesigned for easy reference, catalog 54 commemorates this company's fortieth anniversary in the steam and electrical control field. With the description of products are included quick reference tables on pressure and temperatures, water heads, equivalent pressures. O. C. Keckley Co.

LUBRICATION

324—Force Feed Lubricator
Automatic force feed lubricator Model "94" described in 11-page booklet 94-C will pump against any steam or air pressure up to 1500 lb and will handle any grade of oil from the lightest mineral to the heaviest cylinder stock. Manzel Div. of Frontier Industries.

325—Non-Fluid Oil
This instruction bulletin explains the uses and advantages of Non-Fluid Oil. According to this booklet, it cannot clog fittings, it lubricates until entirely consumed, and will not separate under pressure. A free testing sample of the oil will be sent with the literature. New York & New Jersey Lubricant Co.

326—Diesel Lubrication
Written for everyone interested in the lubrication of diesels, "Lubrication of Diesel Engines," has been revised as technical bulletin B-1, 48-pages. It discusses diesel principles and design, types of engines in use, operating cycles, accessories and choice of lubricants. Sun Oil Co.

327—Oil Filters
Eight-page bulletin F-132 describes in detail construction and operation of hydraulic systems with special emphasis on contamination of hydraulic fluids from various causes, and demonstrates how the correct filtration system eliminates such contamination. Diagram drawings illustrate methods of installing Hilco hydraulic oil filters on various types of circuits. The Hilliard Corp.

328—Bearing Lubrication
"Industrial Bearing Lubrication," is a reprint from the magazine **Lubrication**, October, 1954 issue. The article covers bearing design, surface, overhaul, and aspects of lubrication. The Texas Co.

MATERIALS HANDLING & STORAGE

329—Storage Bins
If you specify vertical storage construction for handling flowable bulk materials, this ten-page foldout will help you visualize how this company's Super-Concrete Stave Storage Bins might meet your requirements. The Neff & Fry Co.

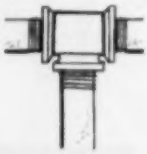
330—Bin Level Indicator
An automatic bin level indicator for all bulk materials is described in 19-page bulletin BD-5A. What it is and how it works is described along with illustrations of typical installations in various industries. The Bin-Dicator Co.

331—Car Spotters and Pullers
Engineering information, instructions for calculating rope pulls and typical layouts for both car spotters and car pullers are available in 24-page illustrated booklet 2092. Link-Belt Co.

METALS & WELDING

332—Nickel Alloys
Helpful technical publications covering the many aspects of nickel alloys, and their applications, are listed in two bulletins. Instructions on how to order literature, free of charge, are included. The International Nickel Co., Inc.

PIPING, VALVES, & SPECIALTIES



333—Air Release Valves
Data sheet 654 describes three different styles of air release valves used for venting air from hot water heating systems, water mains, tanks in pumping systems, water filters, and for releasing air or gas from other liquid lines. Capacity tables show cubic feet of free air handled by various air release valves at different operating pressures. V. D. Anderson Co.

334—High and Low Pressure Valves
Catalog 10 describes List 980 and 990 valves. The 980 is for a pressure range of 200 lb at 100 F to 380 lb at 1000 F. The 990 is for higher pressures. According to the booklet, these valves offer extra protection against excessive stress. Chapman Valve Manufacturing Co.

335—Prefabricated Conduit System
Introduced in four-page folder 5210 is a newly developed large diameter, prefabricated conduit system for protection of underground services. Prefabricated to job requirements, it contains piping for steam, condensate, water lines, fire lines, or process purposes all in place and insulated where required. The Ric-wiL Co.

336—Trapping Practice
Engineers concerned with steam traps should find 48-page catalog *J* a valuable source of data on recommended trapping practice. A maintenance section covers installation, preventive maintenance, trouble shooting, and repair. Armstrong Machine Works.

337—Pump Valves
Pump valves and graphite packings are described in 24-page brochure SC-510. Types, details of construction, design features, applications, how to order, and dimensions are included. Heaters for heating water by blending with steam are also presented. Sims Pump Valve Co., Inc.

338—Float Traps
If you are planning to install low, medium, or high pressure float or float and thermostatic traps, you will need this illustrated catalog sheet. According to the

long haul economy through JEFFREY engineering

Columbus and Southern Ohio Electric Company assigned Jeffrey the problem of drawing coal 6,739 feet from a mine area to its Poston station. Careful engineering produced what is believed to be the longest incline-decline 24" belt conveying system in the country. It carries 300 TONS AN HOUR . . . 570 FEET PER MINUTE. Jeffrey equipment, at both ends of the line and at the transfer point, weighs, crushes and keeps the big Poston bunkers continuously and correctly fed.

Overall view showing Jeffrey decline conveyor leading from transfer point to Jeffrey Boom Storage Conveyor.

Two Jeffrey-Traylor Vibrating Feeders at hopper bottom.

Jeffrey Crusher for reducing oversize coal to the desired stoker size.

Incline belt in gallery to Poston bunkers.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!

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WHEN IT'S
Special BOLTS
and STUDS
Send your Specifications to
ERIE
40 years' experience in making special bolts, studs, nuts for specific job requirements.

Specialists in Precision High Quality
CONNECTING ROD BOLTS

ERIE BOLT & NUT CO.
ERIE • PA.
ONE OF THE
10
INTEGRATED COMPANIES
BARIUM
STEEL CORPORATION
WORKING IN
STEEL, ALUMINUM
MAGNESIUM, FIBERGLASS

REPRESENTATION IN PRINCIPAL CITIES
Circle 553 on Reply Card for more data

bulletins

—Starts on page 106

data sheet, once these valves are installed, there is no necessity for the breaking of any pipe connection for servicing. Hoffman Specialty Manufacturing Corp.

339—Welded Floats

Units made of stainless steel, Monel, and chrome plated steel, in spherical, eliptical, and cylindrical shapes are shown in eight-page bulletin 753. Sizes from 2 to 14 in. dia for pressures from vacuum to 4800 psi are listed with weights, buoyancies, and collapsing pressures. W. H. Nicholson & Co.

Torque Wrenches

Both inch-pound and foot-pound torquers are described in this complete 68-page catalog. Types included are for a wide range of drive sizes with plain or ratchet head. **Please send requests directly to Proto Tool Co., Dept. IP, 2276S Santa Fe Ave., Los Angeles 54, Calif., with 10c.**

340—Hand Threading Pipe

"Helpful Hints on Hand Threading Stainless Steel Pipe and Tubing," data card TDC-147, discusses die stock, dies, speed, cutting oils, and the assembly of threaded joints. It is intended to assist pipe fitters working with hand tools on job sites or in provisional field shops. Tubular Products Div., Babcock & Wilcox Co.

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POWER TRANSMISSION—MECHANICAL

341—Belt Conveyor Design

Engineering data required to design a belt conveyor for any application are presented in 86-page catalog 852. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. The Jeffrey Mfg. Co.

342—Adjustable Speed Equipment

Principle of operation and use of Dynamatic Eddy-Current adjustable speed equipment is described in 16-page bulletin GB-2. Typical torque and load curves are given. Dynamic Div., Eaton Mfg. Corp.

343—Chains and Sprockets

Catalog 950, 340-pages, with its flexible cover and thumb index will prove to be invaluable to the engineer interested in chains and sprockets for conveying, elevating, and power transmission. Tables of pre-engineered drives facilitate selection of standard roller chain drives and silent chain drives. Link-Belt Co.

344—Poly-V Drive

Design characteristics of the Poly-V drive, a single, endless belt with molded length-wise ribs, are explained in eight-page folder 0638. Line drawings and text compare the Poly-V with conventional drives and point out advantages. Manhattan-Rubber *Div.*, Raybestos-Manhattan.

345—Centrifugal Clutch Coupling

Eight-page bulletin CE-3 explains the 11 new important features of the Twiflex flexible automatic centrifugal clutch coupling. This is not just a catalog, but a collection of valuable engineering data on this type of coupling. The Hilliard Corp.

PUMPS

346—Turbo Pump

Each component of the type DE turbo pump is pictured and its design advantages explained in a six-page folder. The lubrication system is also described in detail. Typical uses are listed. The J. S. Coffin, Jr., Co.

347—Proportioning Pumps

Design of the "K" pump, the result of long experience in the solution of proportioning problems, is shown in detail by means of a two-page foldout in five-page bulletin KP-54. Capacity and pressure tables will help you choose pump for your requirements. Hills-McCanna Co.

348—Opposed Impeller Pump

How opposed impellers balance axial thrust is covered in 12-page brochure 1502. Sizes from 2 to 4 in., with 2 to 8 stages, are presented for capacities to 1000 gpm, pressures to 1200 psig, and temperatures to 350 F. DeLaval Steam Turbine Co.

349—Packings

Darcova Pumcups, which permit equipment to be operated at reduced speeds, are described in two bulletins: No. 4502 on Pumcups for air or hydraulic mechanisms; and 4401 on units for reciprocating pumps. Darling Valve & Mfg. Co.

350—Non-Clogging Pumps

Type U non-clogging pumps designed for handling liquids carrying large amounts of solids and foreign materials are described in 11-page bulletin 730-C. The specific uses of each type pump are given along with tables to help in selection. Weinman Pump Manufacturing Co.

351—Plunger Pumps

Graphically illustrated by photos, charts, and line drawings, 11-page bulletin W-44-B45 contains information about the VTE, VTE-1, and VTE-2 types of Plunger Pumps. Units are designed for application in fields such as the petroleum industry, flooding, and salt water disposal. Worthington Corp.

352—Pumps

Condensed catalog "M" describes pumps for every purpose. Among those described are: turbine type pumps for use with small capacities and high heads; and type 66U side suction centrifugal pumps. Aurora Pump Div. of New York Air Brake Co.

353—Package Feeder

Proportioning pumps and package chemical feeding units are described in this four-page folder. With liquid ends available for about 85 percent of all chemical pumping requirements, the pump is designed for use where a controlled capacity is necessary. Bird-Archer Co.

354—Pump Valves

Pump valves and graphite packings are described in 24-page brochure SC-510. Types, details of construction, design features, applications, how to order, and dimensions are included. Heaters for heating water by blending with steam are also presented. Sims Pump Valve Co., Inc.

355—Packings and Gaskets

"Chempac Packings & Gaskets," six-page folder, gives pertinent information

Now—J-M Chempac-Interlocked Packing combines both "Teflon" and asbestos protection

Johns-Manville now introduces Chempac®-Interlocked Packing, with three important advantages for service in chemical and process equipment. Interlocked provides the excellent sealing and heat resistant qualities of asbestos. It is braided by the unique and exclusive J-M method, so that the asbestos yarns are securely interlocked and cannot come apart in service. And it is treated with chemically inert Teflon*, which is almost universally resistant to chemical and solvent action.

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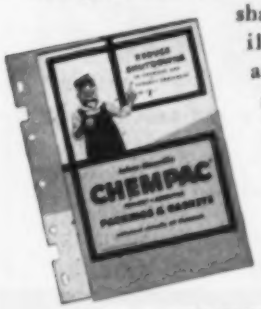

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bulletins

—Starts on page 106

on each of the several types and on solid Teflon sheets. These packings and gaskets are especially designed for chemical and process equipment. Johns-Manville.

356—Sump Pumps

Automatic sump pumps, standard series, explosion-proof, totally enclosed, and submersible type are described in four-page folder 5383. Selection information includes tables of capacities, water consumption, and dimensions. Drawings are shown for sump pumps and pit drainers. Penberthy Injector Co., Div. of Buffalo-Eclipse Corp.

357—General Purpose Pumps

How to determine total head against which pump must operate is only one of the valuable sections in 12-page bulletin 353-1000 on the Bilton pump, a general purpose pump suitable for all classes of medium and low head service. Included are figures on pipe friction, correction charts for elevation and temperature. Byron Jackson Co.

REFRACTORIES & INSULATION

358—Refractories

Charts which show at a glance the properties of refractory castables, plastics and mortars are featured in 20-page catalog R-22. Important information including recommendations for each is presented. Babcock & Wilcox Co., Refractories Div.

359—Refractories & Insulation

Catalogs R-52 through L-93, compiled in a binder form an illustrated 40-page booklet showing where, when, and how to use various types of materials for industrial heat generation and processing equipment. Refractory & Insulation Corp.

360—Efficient Operation

"Good Operating Practices," 12 pages, contains the latest recommendations for getting best service out of insulations, packings, refractory products, roofings, and friction materials. Johns-Manville.

361—Castable Refractory

Two-page spread in booklet 35 shows sectional drawings of a fluid catalytic regenerator and auxiliary catalytic equipment lined with castable refractory. The bulletin also describes the service whereby this company provides engineering, materials, and erection service for vessel lining or heat enclosure jobs. Bigelow-Liptak Corp.

362—Aluminum Jacketing

One of the most frequent problems in the use of aluminum jacketing on insulated lines is how ells, tees, and bends should be weatherproofed. Data Sheet E-130 presents three practical methods. Childers Manufacturing Co.

363—Refractory Concrete

"Refractory Concrete Manual," 16-pages, covers basic information on recommended practice for mixing and placing refractory concrete. Charts and tables put important technical data in a convenient form for easy reference. Lumnite Div., Universal Atlas Cement Co.

TURBINES & STEAM ENGINES

364—Low-Cost Power

If you use steam for heating, cooking, or processing, you can get power at almost no cost with the use of a Wing steam turbine according to bulletin SW-1a. Construction of these units gives an almost infinite range of speeds, easy control by throttling, and the units are independent of any electric power failure. L. J. Wing Mfg. Co.

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365—Steam Turbines

Fully-illustrated 24-page bulletin 1961 emphasizes the flexibility of design of the Type-S turbine which is said to make possible selection of the proper number of stages, governor, and controls to give maximum efficiency for your steam and operating conditions. Worthington Corp.

366—Multi-Stage Turbines

Smaller framed, multi-stage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, diaphragms, and many other design features are discussed and illustrated. The Terry Steam Turbine Co.

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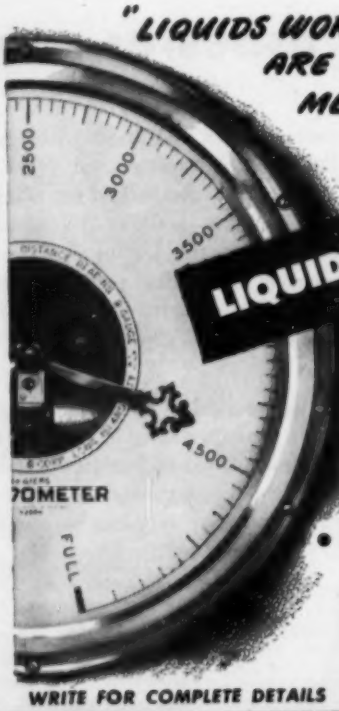

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367—Turbine Speed Control

"Fundamentals of Turbine Speed Control," 32-page brochure H-21, is an educational piece intended to clarify the operation of common types of automatic speed control for steam turbines. Simplified diagrams illustrate operating principles of actual control systems. Elliott Co.

368—Steam Turbine Selection

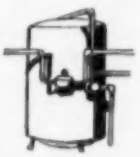
Full details of this company's steam turbine are given in bulletin 135. Drawings and installation photographs point out the special features. How to save operating and maintenance costs by buying the right size for individual needs is explained. Coppus Engineering Corp.

WASTE DISPOSAL

369—Waste Treatment

How this company has solved waste treatment problems for such industries as electro-plating, refinery, gas, and metal finishing is treated in detail in six-page booklet 70-B. A handy bibliography serves as a reference for more information. Infilco, Inc.

WATER TREATMENT



370—Water Analysis

Published by a company engaged exclusively in the solution of industrial water conditioning problems, this 14-page brochure contains brief descriptions of testing and control equipment necessary for the more common water analyses. W. H. & L. D. Betz.

371—Water Purification

"Boiler Feedwater Treatment," 19-page bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion-exchange by means of chemical formulas and flow diagrams. Hungerford & Terry, Inc.

372—Ion Exchangers

Strongly basic anion exchanger is presented in bulletin 57 which includes complete data on physical characteristics, exchange capacity and regeneration technique. National Aluminate Corp.

373—Water Conditioning

The entire line of water conditioning equipment and specialties is briefly covered in four-page bulletin 6210. Where more detailed booklets are available each description carries the identification number of such booklet. Cochrane Corp.

374—Filters and Strainers

Quick coupling, non short-circuiting fluid filters and strainers for water, chemicals, and oils can solve many maintenance problems for you according to four-page folder 654-MC. Ronningen Mfg. Co.

375—Boiler Water Treatment

Difficulties caused through industrial water contamination are outlined in a 12-page catalog. Recommended water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions, and efficient control methods are described. E. F. Drew & Co., Inc.

376—Deaerators

Spray-atomizing type units are shown in cross-section in four-page booklet 400. Function, design and operation, construction, outstanding features, and uses are discussed. American Water Softener Co.

377—Boiler Water Foam

Laboratory pictures in this four-page folder show how Concentrol controls boiler water foam. Examples of its use in various industries are given along with an explanation of foaming. Bird-Archer Co.

378—Free Check-Up Service

SECA Report 50694 explains the service offered by this company whereby any make zeolite water softener will be checked by a field engineer, free of charge, and the results submitted to the owner of the equipment in exact figures and percentages showing just how efficient his equipment is, with recommendations on how to increase its usefulness. Elgin-Refinite, Div. of Elgin Softener Corp.

379—Ground Water

Methods of abstracting water from the ground or by infiltration through permeable beds of rivers or other bodies of water are discussed in 20-page bulletin. Performance charts for this company's collector are supplemented with cross-sectional drawings and cut aways. Ranney Method Water Supplies, Inc.

380—Demineralization

"Demineralization including Silica Removal by Ion Exchange," 28-page booklet 3803, describes applications, principles of operation, and gives recommendations for demineralizing and silica removal apparatus and synthetic resins. The Permutit Co.

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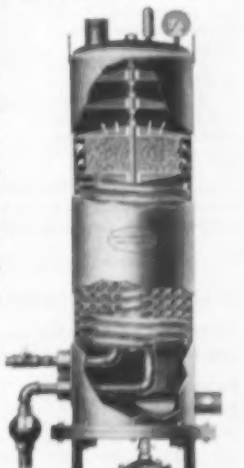

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PLANT ENGINEER'S EASY PROBLEM SOLVER by Louis J. Murphy; Conover-Mast Publications, Inc.; 355 pages; $6.00.

Reviewed by Edward R. Estes, Jr.
University of Virginia
School of Engineering

For the engineer who has a variety of problems to solve but never enough of one type to warrant construction of nomographic charts or tables for their solution, this book should be a helpful reference.

The many charts and tables in this book cover the subjects of metal working, heating, ventilating, air conditioning, refrigeration, piping systems, and pumps. There are also sections on compressed air, mechanical power transmission, materials handling, industrial waste treatment, internal combustion engines, and liquid-storage tanks. Plant safety and maintenance receives a limited amount of attention.

The bulk of the charts are concerned with metal working and heating, ventilating and air conditioning. The metal working charts are useful in planning, estimating, scheduling, and operating problems. Satisfactory designs of heating, ventilating, and air conditioning systems can be made with the charts in this section.

A detailed explanation and illustrative problem accompany each chart. The majority of the charts are quite simple to use and give slide rule accuracy.

ALSO AVAILABLE

ALTERNATING CURRENT MACHINES, Third Edition, by A. F. Puchstein, et al; John Wiley & Sons, Inc.; 721 pages; $8.50. Describing construction, principles of operation, methods used for making and working up tests, and simple methods for predicting behavior, regulation, and performance, this text includes significant new changes. Approaches to the theories of some of the machines have been modified, and more detailed developments of equivalent circuits, vector diagrams, methods of calculating the cross-axis voltages of synchronous machines, and equations describing oscillations of synchronous motors are provided. Additional material has been added to clarify the polarities of the transformer and speed voltages.

MAGNETIC CONTROL OF INDUSTRIAL MOTORS, Second Edition, by Gerhart W. Heumann; John Wiley & Sons, Inc.; 714 pages; $9.50. This second edition has been brought completely up to date in line with recent advances in the electrical art. It includes much new material on adjustable voltage and regulating systems, particularly with regard to rotating and magnetic amplifiers. Obsolete controller designs have been entirely eliminated. Reference material has been thoroughly modernized and emphasis has been placed on the theoretical background underlying recognized National Standards and Safety Codes. Considerable stress is placed on explaining rules of the National Electrical Code which apply to motor controllers.

TURBINE OPERATING AND OUTAGE DATA FOR 1953, Publication No. 54-15; Edison Electric Institute; 17 pages; $1.00. A report of the Turbines and Condensers Subcommittee of the Prime Movers Committee, Edison Electric Institute, this book gives average turbine data and performance for varying lengths of service, outage factors for units of varying operation, and operating and outage data tables.

NATIONAL ELECTRICAL CODE HANDBOOK, 1954, Eighth Edition, revised by Charles L. Smith; McGraw-Hill Book Co.; $10.00. This handbook explains the NEC rules in brief, easy-to-understand language. Gives the general plan, scope, and intent of Code requirements. Format has been changed to provide greater ease in use—various sections of the book are numbered exactly as the Code.

STANDARDS PUBLICATION FOR POWER SWITCHING EQUIPMENT, No. SG6-1954; National Electrical Manufacturers Association; $2.75. This book deals with such power switching equipment as air switches; inter-

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rupter switches; bus supports, insulators, accessories (operating mechanisms, switch hooks or sticks, interlocks, and auxiliary switches), and outdoor stations (structures, pole-top frames, etc.). Instructions are given for the installation, operation, and care of such equipment.

MANUFACTURE AND APPLICATION OF LUBRICATING GREASES by C. J. Boner; Reinhold Publishing Corp.; 977 pages; $18.50. This book describes fully the structure and theory of lubricating greases, with information on raw materials, processes, and manufacturing equipment. Lubricants containing specific thickeners and additives, including such new developments as lithium soaps, complex soaps, and non-soap gelling agents, are treated in detail. Emphasis is placed on the effects of each ingredient or treatment upon characteristics of final product.

WELDING FOR ENGINEERS by Harry Udin, et al; John Wiley & Sons, Inc.; 430 pages; $7.50. This book offers the reader an appreciation of welding as an art and a science. It is treated as a field in itself, drawing on principles from physics, mathematics, chemistry, metallurgy, and mechanical engineering. Each unit process is presented after its basic principles have been developed. The book is based on a set of notes used as text material in a course at the Massachusetts Institute of Technology.

FILMS

BIBLIOGRAPHY OF MATERIALS HANDLING FILMS. This is a compilation from a survey by the American Materials Handling Society. All the films listed are devoted to industrial problems and give basic information applicable to equipment selection, methods improvement, and selling of ideas to management.

"CLEAN WATER;" General Electric Company; 16 mm; sound; color; 25 minutes. This is a new version of an earlier work. It is designed to create an awareness of the growing problems of stream pollution. Besides demonstrating the nationwide threat, the film prescribes remedies—industrial waste treatment and modern municipal sewage disposal plants.

FILMS BY BETHLEHEM STEEL, 19-page booklet 364 lists industrial and educational films available free of charge. These are all 16 mm sound movies dealing with steel making, steel products, fabricated construction, and ship building.

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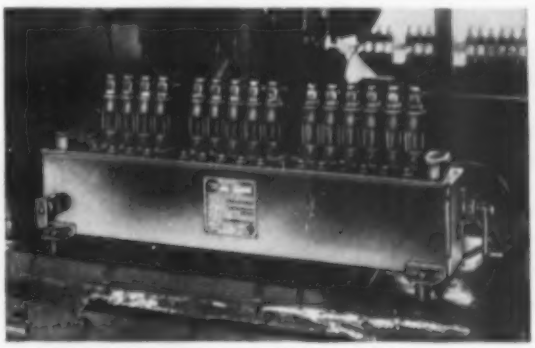

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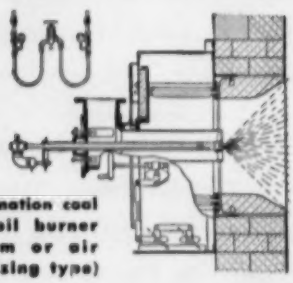

Combination coal and oil burner (Steam or air atomizing type)

Combination coal and oil burner (Mechanical atomizing type)

Enco Burners

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names make news

. . . personalities from industry and power

American Blower Corp. announces opening of direct factory branch offices at Portland, Oregon and Fort Wayne, Ind. **W. S. Cooper** will manage the Portland office, and **J. W. Johnson** will be Fort Wayne manager.

National Supply Co., Engine Div.—**D. C. Vick**, formerly at Springfield, Ohio, is transferred to Lincoln, Nebraska. **R. A. McCloskey**, who worked with Vick, is now working in Ohio, Ky., W. Va., and southern Ind.

Minnesota Mining & Mfg. Co., Adhesives and Coatings Div., appoints **Lawrence C. Houdek** division engineer of the Division.

Cochrane Corp. has appointed Turbine Equipment Co., of Glen Falls 3, N. Y., as representatives for upper eastern New York State area.

Westcott **Hartford**

★ During the President's Luncheon at the Annual Meeting of the American Society of Mechanical Engineers, Harry Westcott, president of Westcott & Mapes, presented Ernest Hartford, retiring Deputy Secretary of ASME, with a book of letters of tribute written by prominent engineers in appreciation of Hartford's 43 years of service to the engineering profession.

Corning Glass Works—**E. K. Sutherland**, senior field engineer in the mechanical engineering dept., is appointed manager of the newly created automation engineering dept.

Minneapolis-Honeywell Regulator Co. has purchased all outstanding capital stock of **Doelcam Corp.**, of Boston, Mass. Doelcam will operate as a new division of Honeywell. In the Valve Div. of Honeywell, **Ralph A. Rockwell** is appointed chief engineer.

De Laval Steam Turbine Co.—**Harry Engvall**, formerly chief engineer of the Turbine and Gear Dept., is promoted to the post of executive engineer. **John S. Haverstick** becomes chief engineer in his place.

National Electric Manufacturers' Association—New officers are: **Albert F. Metz**, Okonite Co., president; **W. A. Elliott**, Elliott Co., **F. F. Loock**, Allen Bradley Co., **J. J. Mullen, Jr.**, Moloney Electric Co., **B. C. Neece**, Landers, Frary & Clark, and **W. V. O'Brien**, General Electric Co., vice presidents; and **A. A. Berard**, Ward Leonard Electric Co., treasurer.

Goodyear Tire & Rubber Co. and **Stephens-Adamson Mfg. Co.** have incorporated a new company under the name of **Passenger Belt Conveyors, Inc.** for the purpose of engineering, developing, selling, and installing passenger belt conveyor systems. President is **Sam DuPree** of Goodyear, and vice president is **D. L. Stephens** of Stephens-Adamson.

Wilkening Mfg. Co. appoints **John O. Lutz** as assistant chief engineer.

Link-Belt Co. announces appointment of **William J. Brinkworth** as manager of oil field sales. **James G. Samuell** will succeed Brinkworth in Houston, Texas as district manager. **John R. Sybesma** will be district representative in Houston.

Hungerford & Terry, Inc. announces appointment of **R. D. Murphy** as representative in northern Ohio. His offices will be at 6801 Euclid Avenue, Room 2, Cleveland 3.

Burgess-Manning Co. and **Penn Industrial Instruments Corp.** announce tentative plans to merge. Under the proposed plan, Penn would continue operating with its present management as a separate division of B-M.

Westinghouse Electric Corp.—**Dr. Ernest A. Lederer** becomes chief engineer for the Electronic Tube Div. **Carmen E. Ramich** takes over Dr. Lederer's former post as manager of engineering, and **Dewey D. Knowles** is manager of product administration.

Allis-Chalmers Co. appoints **H. D. Emmert** as assistant chief engineer of the Steam Turbine Section, Power Department.

Federal Pacific Electric Co.—**E. A. Williams** is appointed manager of the Eastern Switch Gear Div. His headquarters will be at the new switch gear plant in Scranton, Pa.

The Permutit Co.—Industrial Sales Dept. announces appointment of **K. G. Barnhill** and **E. J. Connelley** as sales

engineers at Boston, Mass., and Cincinnati, Ohio, respectively.

Dravo Corp., Machinery Div. has appointed **Gustav Schwab, Jr.** as manager of the Marietta, Ohio pipe fabrication plant.

Byron Jackson Company's wholly owned subsidiary, B. J. Service, Inc. announces naming of **Matthew B. Riordan** as vice president in charge of engineering research and development.

Lindberg Industrial Corp. appoints **Hjalmar A. Anderson** as chief project engineer.

U. S. Hoffman Machinery Corp. has combined the Air Appliance and Industrial Filtration Divisions into a new division to be known as the Industrial Equipment Div. **Revis L. Stephenson** will be vice president in charge of the new division.

Claude B. Schneible Co. appoints **Harry E. Gravlin** as vice president and general manager.

General Electric Co.—In the Transformer Div., **William S. Ginn** is appointed general manager of the division and **Joseph W. Seaman** is appointed general manager of the Power Transformer Dept.

Russell E. Meyers becomes manager of manufacturing facilities and engineering in the Capacitor Dept. In the Distribution Transformer Dept., **Francis L. Woods** is appointed manager of engineering.

Electric Auto-Lite Co.—In the Central Engineering Div., **H. D. Wilson is** appointed administrative assistant to **L. H. Middleton,** vice president in charge of engineering. **George Spaulding** is named chief ignition engineer, and **Howard C. Burns** is promoted to chief engineer of the Battery Div.

The Pennsylvania Railroad—W. Parker Stuart is appointed general coal traffic manager with system-wide jurisdiction. Newly appointed coal traffic managers are **A. Lynne Braburn, Jr.** eastern region, Phila.; **Herman H. Lippold,** central region, Pitts.; and **Martin E. Klein,** western region, Chicago.

Weinman Pump Mfg. Co.—Harvey R. Ray is appointed sales manager to replace the late **E. D. Bader.** Ray was formerly supervisor of facilities design with General Electric's Aircraft Nuclear Propulsion Dept.

Babcock & Wilcox Co., Boiler Div. appoints **George W. Kessler** as chief engineer. B&W has purchased assets and business of the Globe Steel Tubes Co. of Milwaukee. The plant will be operated as a part of the Tubular Products Div.

Vertical Turbine Pump Association elected the following officers to serve during 1955: president, **Warren L. Bremer,** Layne & Bowler Pump Co.; vice president, **William H. Reeves,** Layne & Bowler; secretary-treasurer, **B. A. Tucker,** Peerless Pump Div., Food Machinery and Chemical Corp.

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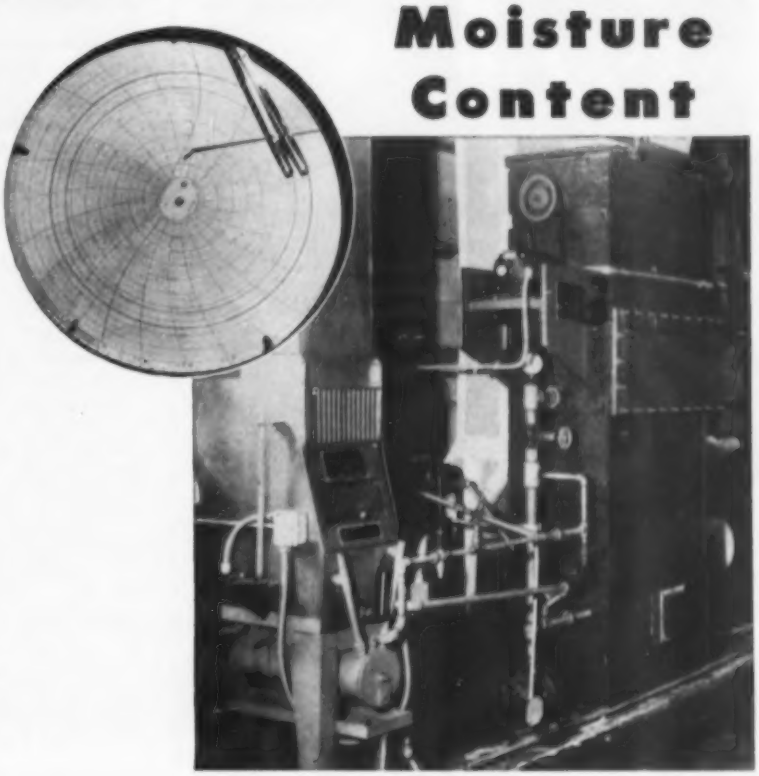

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TRANSFORMERS

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ideas in action

—Starts on page 108

questioned when they sought to describe automatically controlled operations.

The consensus was that "automation" embraces automatic handling of materials; control of temperature, pressure and velocity; automatic processing; assembly of parts; measurement of variables; operation of aircraft, missiles; receiving, storing and shipping functions; computing and data handling; control of household devices; and cost accounting.

Most of the engineers and technicians did not consider "control" to be a part of instrumentation. In their opinion, "automation" is the whole of which instrumentation is but a part.

George M. Muschamp, vice president engineering, of Honeywell's Brown Instrument Div., told executives attending an engineering-productivity session sponsored by the Society for the Advancement of Management that they should "adopt a do-it-yourself attitude" in regard to automation. He suggested that they allow their plant engineering departments greater freedom to develop new automation techniques and equipment rather than wait for equipment manufacturers to diagnose their problems and prescribe cures.

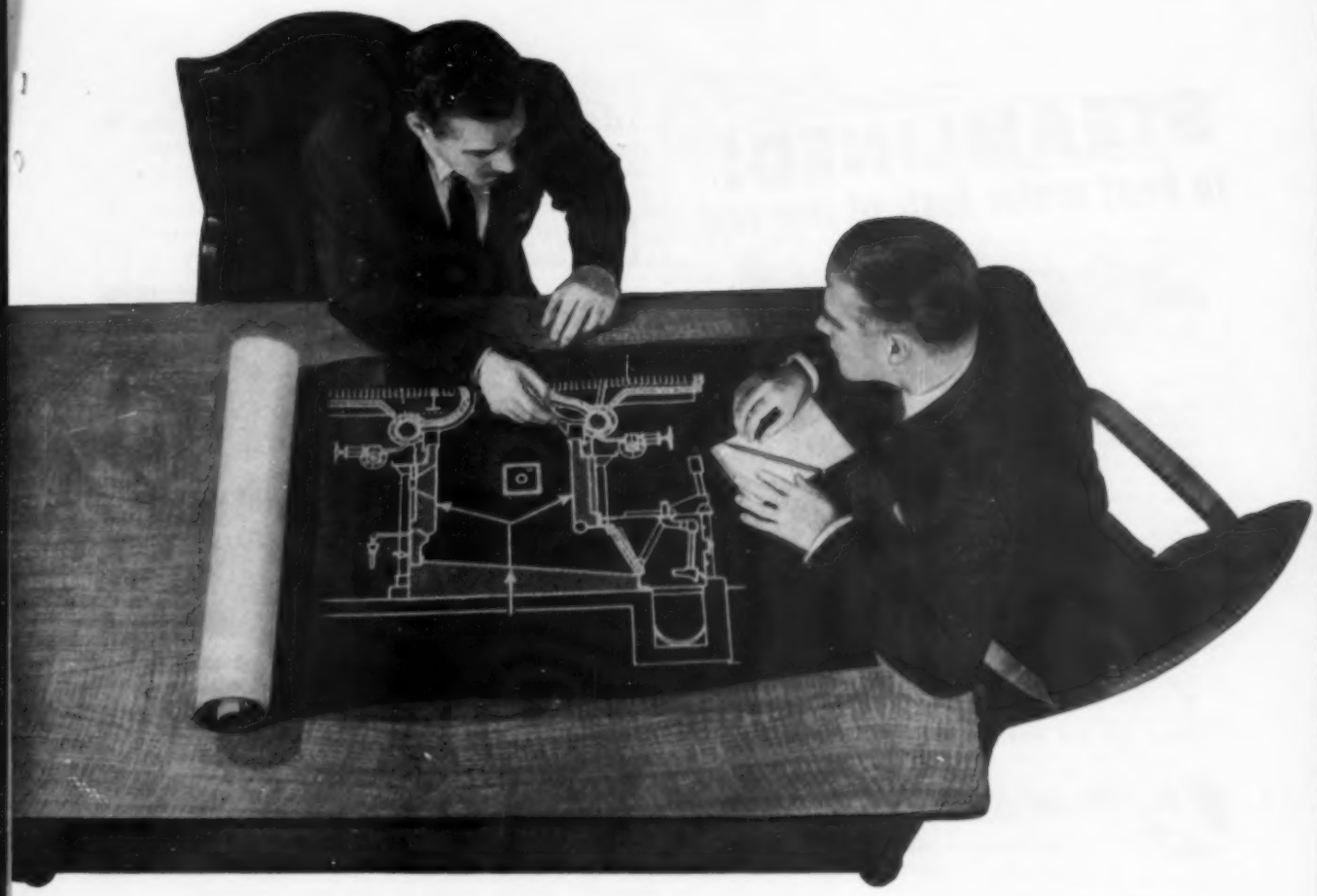
Alloy Spray Coating Simplifies Valve Reclaimation

Reclaiming plug-type line valves is complicated by the fact that the welded plug tends to warp. Because of this possible warpage, the packing area on the plug neck has to be built up also and then machined to run concentric with the plug taper.

At Hamer Valves, Inc., Long Beach, Calif., an arc welded overlay method was used for rebuilding worn and damaged valve plugs and bodies. The valve body seating surface was arc-welded, rough machined, and ground oversize. After removal of the original hard-chrome tapered surface, the plug was rebuilt with an arc-welded overlay to produce an oversize dimension.

The procedure has been simplified with use of the Colmonoy Sprayweld process. After being built up, the plug was formerly rough machined and the tapered seating surface ground 0.006 in. smaller on the diameter than the oversize rebuilt valve body. The plug then had to be chrome plated and finish ground to precisely fit seating surface of the valve body. In the new process, the valve body seating surface is still arc-welded and ground oversize. In reclaiming the plug, the original chrome plated tapered seating surface is removed, and where necessary, cavities and surface imperfections are electric arc-welded and rough machined. Surface to be Spraywelded is then grit blasted, acid dipped, soda dipped, steam cleaned, and air-blast dried to provide a surface that will insure positive mechanical bonding of the sprayed deposit to prevent its lifting during fusing.

Colmonoy No. 4 powder is applied with a Spraywelder pistol unit and heated with the flame of an oxy-acetylene torch just enough to fuse the overlay but not enough to cause warpage. The result is a fusion-bonded non-porous welded overlay that is high in abrasion, corrosion, and impact resistance. The coated plug is then finish ground to match the valve body.



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Cuts ashpit maintenance with B&W Refractory Concretes

A trial installation of B&W Refractory Castable "A", a 2600 degree refractory concrete, was made in one boiler ashpit. To date this castable has given 25 months more maintenance-free service than the refractories previously used.

Results of this first trial were so encouraging that another ashpit, shown in the drawing above, was lined with B&W Refractory Castable "A". In this installation the two opposing high velocity water sprays cut refractories life two ways. First, water splattered on the hot walls (about 1800F) caused spalling. Second, the high velocity water jets had an abrasive effect on the floor refractories.

Here's the report: "After 20½ months service, B&W's Castable "A" lining was still in excellent condition—far superior to the refractories used before."

On the basis of these trials three other boiler ashpits have been lined with this 2600 degree castable.

In addition to ashpit linings, B&W Refractory Castable "A" is widely used in boilers for baffles, hearths, door linings, special shapes, repairing eroded brickwork and forming pier walls in stoker-fired boilers.

B&W Castable "A" is only one of a line of B&W Refractory Concretes which cost-conscious boiler operators are putting to increasing use in many different applications. These B&W Concretes may help you cut installation costs and lengthen furnace life. Consult your B&W Field Engineer.

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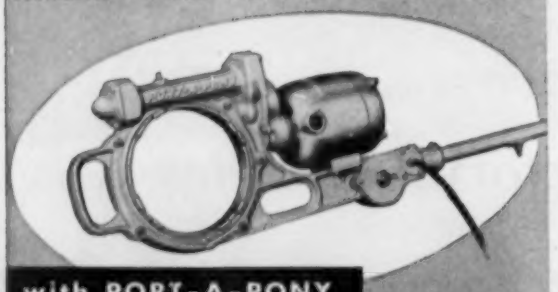

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ideas in action

—Starts on page 100

Steel Spring Ejects Slug from Hole Saw

Hole saws used to make circular cut-outs in Fiberglas aircraft battery boxes at TEMCO Aircraft Corp. were a production bottleneck since the Fiberglas slug packed in so tightly that the tool had to be partially disassembled to remove it.

Plastic fabricator Frank P. Rose, Jr. hit on the idea of a steel spring ejector. A 3½ in. length of steel wire is wrapped twice around the ½ in. hole saw pilot, pulled tight to secure the wire on the pilot, and then the remainder of wire bent into a four-coil, cone-shaped spring. The spring compresses as the holesaw makes its cut. When the cut is complete, spring pressure is sufficient to pop the slug out of the saw. The ejector works on hole saws of any size.

meetings

. . . and exhibitions

Jan. 24-27	Plant Maintenance and Engineering Show (Exposition and Conf.)	Int'l Amphitheater Chicago, Ill.
Jan. 24-28	American Society of Heating and Vent Engrs. (15th Int'l Exposition)	Commercial Museum Philadelphia, Pa.
Jan. 31-Feb. 4	American Institute of Electrical Engineers (Winter Meeting)	Hotel Statler New York, N.Y.
March 7-11	National Association of Corrosion Engineers (Annual Convention)	Palmer House Chicago, Ill.
March 14-18	American Society of Tool Engineers (Western Industrial Exposition)	Shrine Auditorium Los Angeles, Calif.
March 20-23	American Institute of Chemical Engineers (Spring Meeting)	Kentucky Hotel Louisville, Ky.
March 28-29	American Institute of Electrical Engineers (Materials Handling Conf.)	Hotel Cleveland Cleveland, Ohio

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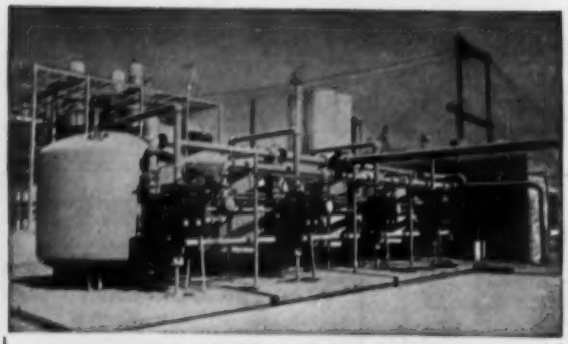

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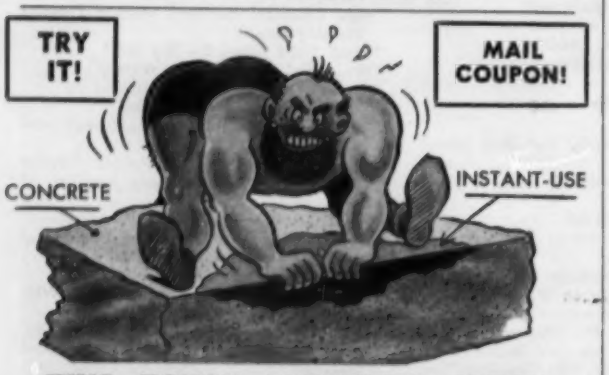

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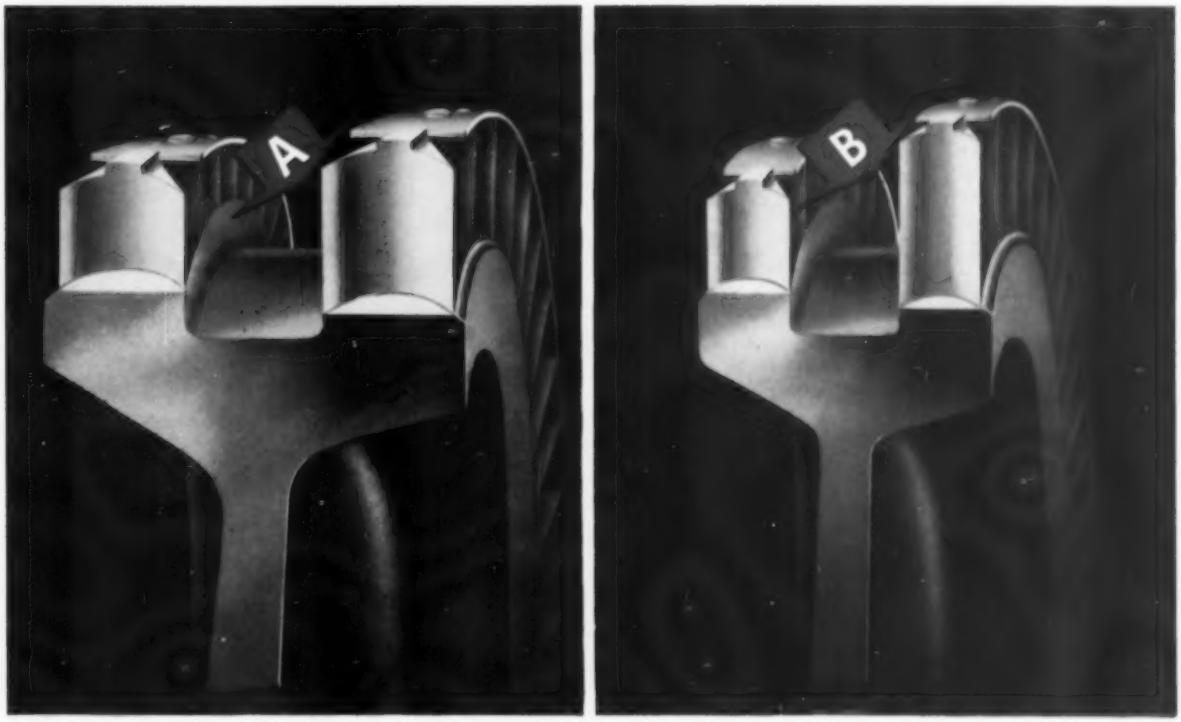

(Left, A) wide bucket "L" type wheel. (Right, B) regular type wheel for Coppus Steam Turbines

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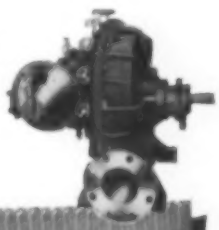

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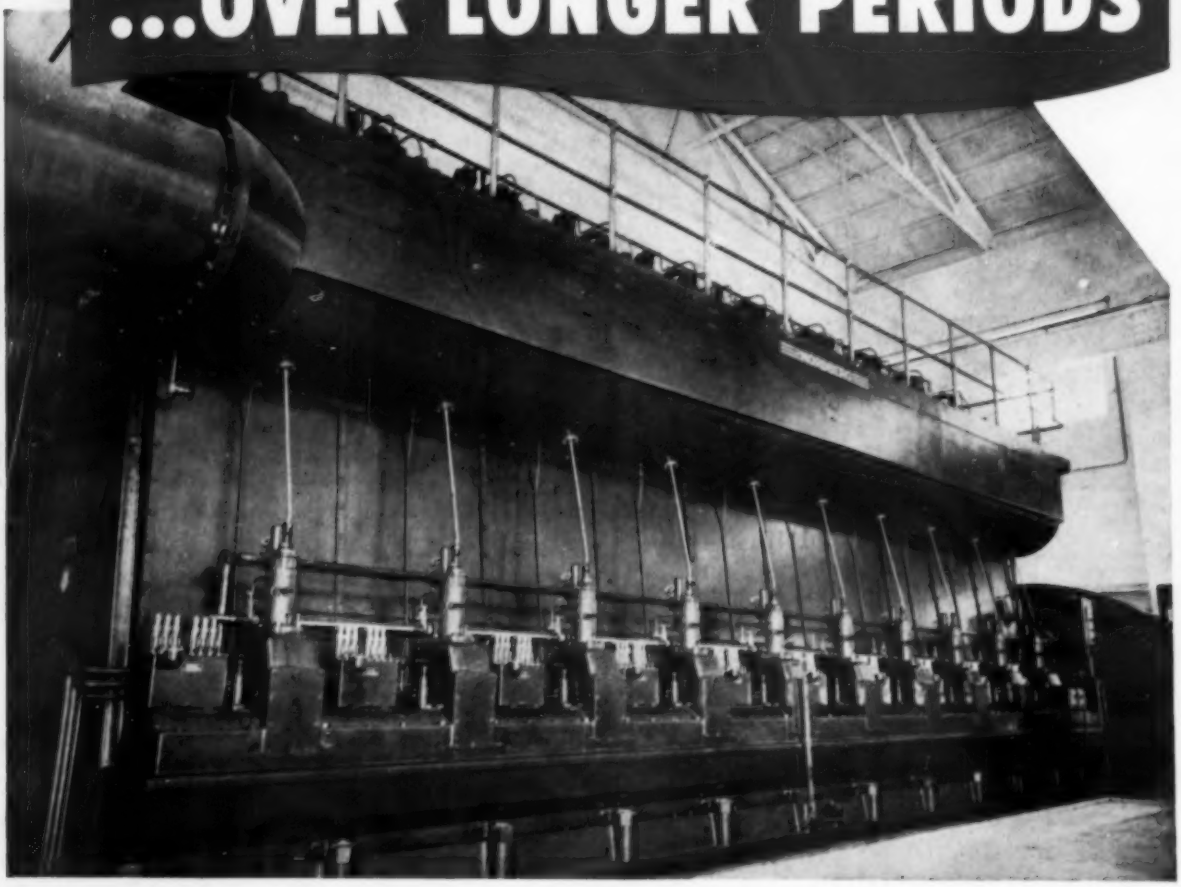

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